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BRIEFLY TOLD.

HYSTERICAL CORRESPONDENCE.—Mr. Walter King, of 11 Bolt Court, Fleet street, London (England), E.C., is evidently the main man in connection with the editing and publishing of the *Journal of Gas Lighting, Water Supply*, etc., for we "note" that, in his "Notices to Correspondents, Advertisers and Subscribers," as published in his *Journal*, it is directed that "all communications, remittances, etc.," shall be addressed to him, at the address given or named above. We know that any communication mailed to the address given will be acknowledged with his "compliments and thanks." All this is a prelude to our quandary in the present instance, since our predicament is that we know not his editor. Judging, however, that the man who receives the remittances is the mainspring of the office of the *Journal of Gas Lighting*, and in the absence of an editor duly named, we appeal to the remittee to curb the fancies of his penman who indites the articles under the caption of "Gas Matters in the United States." Knowing not the penman, whatever stricture we may have to make on that which he penned cannot be construed as starting from the personal. Mayhap the whole thing is not worth the present thought or mention; but that which we would like to and do say, in connection with Mr. King's correspondent's last chapter concerning "Gas Matters in the United States,"[1] is that his conception of "The Contest for the Control of the Steatite Industry" in America is very wide of the mark. There may be a "rattling good contest on" for such control, but it does not, either on face or from bottom, show as "only a family quarrel," or as a contest concerning the private affairs of a family in Chattanooga, Tenn.; nor is it a "battle between two groups of capitalists to control the industry for which they foresee a great future." We cannot be much plainer spoken here and now over the matter, in that more direct reference or speech thereto would take on the shape and color of advertising. But we may in all fairness say that the "family in Chattanooga, Tenn.," mindful of the value in commerce of that which it owns, proposes to retain the actual and working possession of the deposits which it originally exploited; and at least one English firm will eventually comprehend what such working ownership means. That which we would say, however, in connection with the correspondence and deposit ownership referred to therein, is that amity and combination will not in any sense be forwarded by paragraphs of the nature penned by Mr. King's correspondent. For, if we mistake not the signs of the times, such a thing as the union of some of the mechanical and other forces of America and Great Britain is not at all improbable.

1. *Journal of Gas Lighting*, Aug. 27, 1901, p. 509.

NOTES.—Mayor Jones, of Toledo, O., in spite of all prediction and assertion to the contrary, signed the agreement and ordinance under which the Toledo Gas Light and Coke Company will operate the city's natural gas plant for the next 20 years. Mr. O'Day must certainly have known there was trouble in store for him when Mr. Charles R. Faben, Jr., decided to wear a smoother face.——Mr. H. Malloch has been appointed resident manager for the Colusa (Cal.) Gas and Electric Company.——The proprietors of the Peoples Gas Light and Coke Company, of Chicago, have decided to increase its capital stock in the sum of $5,000,000—from $30,000,000 to $35,000,000.——The reorganization of the gas and electric lighting properties of Freemont, O., has finally been completed. The succeeding concern, which is to be known as the Fremont Gas Company, represents a consolidation of the properties of the Fremont Gas Company, the Fremont Electric Light and Power Company, the Creager Electric Company and the Northwestern Natural Gas Company, as to the latter's possessions in Fremont. The Directors of the new Company are: Messrs. M. B. Daly, Toledo, O.; H. J. Lesher and James T. Lynn, of Detroit; and Frank Heim and Al. Bauman, of Fremont. Mr. John M. Lynn, formerly in charge at Portsmouth, O., has been appointed Superintendent of the Company.——We are indebted to "C. F. M." for the following clipping from the Newark (N. J.) *Call*, dated the 1st inst.: "Yesterday, rounded out 25 years' service, with the Essex and Hudson Gas Company and its predecessors, of Newark, N.J., by Mr. F. H. Williams, its Orange Manager. Mr. Williams entered the employ of the Orange Gas Light Company in 1876, and rose from one position of trust to another till he was made Manager of the Orange district. Yesterday noon the employees of the Orange office recognized the event in a pleasant way. They sent a message to Mr. Williams that he was wanted in the office on important business, and when he appeared, George M. Hankins, next to Mr. Williams the oldest employee in term of service in the Orange district, stepped forward and presented to him in behalf of the employees a handsome silver service of 6 pieces. He spoke of the record Mr. Williams had made for himself of the uniform

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kindness and courtesy with which every employee had been treated by him, and closed by wishing Mr. Williams another quarter century of success in the office. Mr. Williams was entirely taken by surprise, but expressed his thanks in appropriate language. The tea service is of solid silver of artistic design, and on each of the pieces is engraved the initial 'W.' The tray in addition to the initial carries the dates '1876–1901.' A few years ago the late John I. Blake, then President of the Newark Gas Light Company, presented to Mr. Williams, on behalf of the Company, a handsome and costly gold watch in recognition of his faithful services."

Our Coal Exports.

The *Scientific American* says that coal exportations from the United States during the fiscal year just ended, as shown by the Treasury Bureau of Statistics, amounted to $22,317,459, against $19,502,813 in the fiscal year 1900, $13,661,028 in 1899, $11,008,643 in 1897, $10,646,062 in 1896, and $8,391,026 in 1891. Thus the value of coal exportations from the United States has doubled since 1897 and nearly trebled in the decade. These figures relate to values. Measured by quantity the increase has been even greater, the exports in 1901 being 7,676,149 tons, against 2,399,039 tons in 1891, thus making the total exports of 1901 in quantity more than 3 times as much as in 1891.

The United States now stands third in the list of coal exporting countries of the world. The coal export figures of the principal countries of the world in 1899 show that while Belgium slightly exceeded the United States in the total number of tons exported, her imports were more than one-half as great as her exports, making her net exportation of coal much less than that of the United States. The figures of coal exports during 1900 recently published by the British government, a copy of which has just reached the Bureau of Statistics, show that the coal exports of the 3 principal coal exporting countries—the United States, Germany, and the United Kingdom—in 1900 were: United States, 7,558,000 tons; Germany, 18,055,000 tons; and United Kingdom, 58,405,000. Thus, while the growth of the coal exports from the United States shows a large percentage of increase, these figures of the exportation of coal from Germany and the United Kingdom show that the field occupied by those countries is still much larger than that which the United States now supplies.

In growth of both exports and production, however, the United States had made much more rapid advance than any other country. The total quantity of coal produced in the United Kingdom was, in 1886, 157,518,000 tons; in 1900, 225,181,000 tons; while in the United States the production was, in 1886, 100,664,000, and in 1900, 245,422,000. Thus the United Kingdom since 1886 has increased her production but about 50 per cent., while the United States has increased hers nearly 150 per cent.

The cost of coal has meantime increased much more rapidly in the United Kingdom than in the United States. The value of the 157,000,000 tons of coal mined in the United Kingdom in 1886 is put by the statement of the British government above referred to at £38,000,000 sterling, and of the 225,000,000 tons mined in 1900, is put at £121,000,000 sterling. Thus, while the quantity mined in the United Kingdom has increased but 50 per cent. from 1886 to 1900, the value has meantime increased over 200 per cent. On the other hand, the value of the 100,000,000 tons of coal mined in the United States in 1886 was, according to the same authority, £32,000,000 sterling, and that of the 245,000,000 tons mined in 1900, £67,000,000 sterling. Thus, in the United States, while the quantity increased about 150 per cent., the value of the coal mined increased but a little over 100 per cent.

The relative increase in the cost of coal in the United Kingdom and the United States is shown in an even more striking form in the statement of the British government above referred to by a table which gives the price per ton of coal in the United Kingdom and the United States in 1888 and 1900, respectively. It shows that the price in the United Kingdom advanced from 5s. per ton to 10s. 9d., from 1888 to 1900, while in the United States it fell from 6s. to 5s. 5¼d. per ton in the same time. Another table in the same statement shows the relative value per ton of coal produced taken at the pit's mouth in the United States, United Kingdom, Germany, France, and Belgium, in 1899, to be as follows:

Country.	Value per Ton. Shillings.	Pence.
France	9	12
Belgium	9	11
Germany	7	9
United Kingdom	7	7
United States	4	8½

[Official Report.—Revised by the Secretary.—Concluded from Page 370.]

PROCEEDINGS, NINTH ANNUAL MEETING OF THE PACIFIC COAST GAS ASSOCIATION.

Held in the Offices of the San Francisco Gas and Electric Company, July 16, 17 and 18, 1901.

Second Day, July 17, Afternoon Session.

The President introduced Mr. A. C. Beck, of Oakland, Cal., who read the following paper on

EXPERIENCE WITH CARBURETTED WATER GAS SETS.

In the preparation of this paper, on "Experience with Carburetted Water Gas Sets," I have endeavored in a practical way to illustrate certain improvements, which were made necessary by conditions at our works, to offset and obviate certain defects in manufacture as well as to add to the efficiency of the machines under my charge.

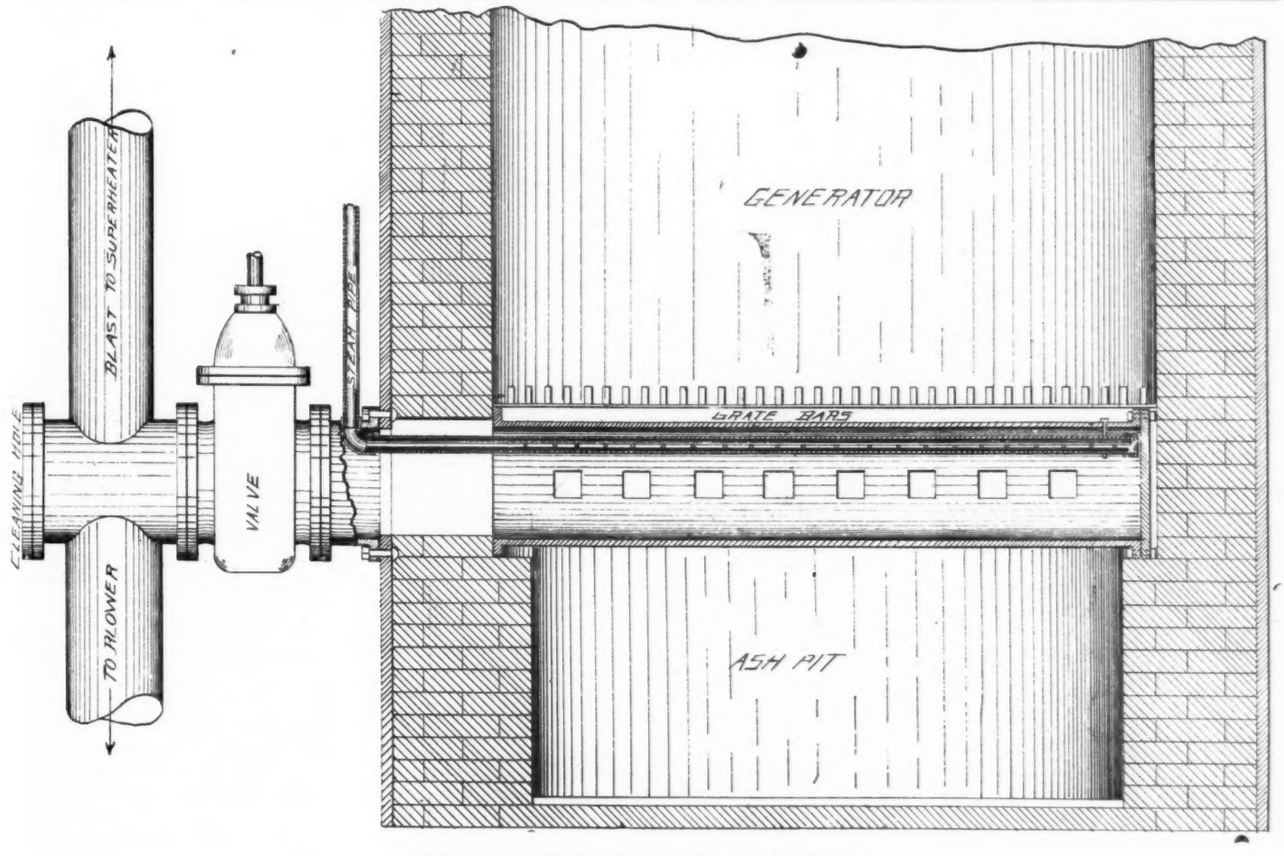
In the fall of 1896 we were operating two Springer sets, with a grate 5 feet in diameter, the superheater being 10 feet in height, or 15 feet including the arches. The idea was conceived that, by lengthening the amount of superheating surface, so as to give the Coalinga oil, which we were then using, an opportunity of being treated with longer exposure to the superheating surface, better results might be obtained. As is well known, the Coalinga oil gives off its distillates at a very low temperature in comparison with other gas oils. The idea was to run it with lower heats than it was possible to do before. The result with the set demonstrated that, whereas prior to that time, with high heats necessary with short superheating surface to crack the oil, naphthaline had been a great source of annoyance, upon the use of this added superheater surface and lower heats the naphthaline disappeared as if by magic. The heat being more easily controlled than in a shorter superheater, we were enabled to keep the checkerbrick very much cleaner, as any deposition of lampblack or any of the residuals of the oil, which would be given off abruptly under a high heat, are permitted to be utilized for illuminants with a low heat.

The other Springer set has never been changed, still remaining with a short superheater; and when it has been possible to run one set, the difference in the results of manufacture, both in the amount of coal used and in the amount of oil, is noticeable.

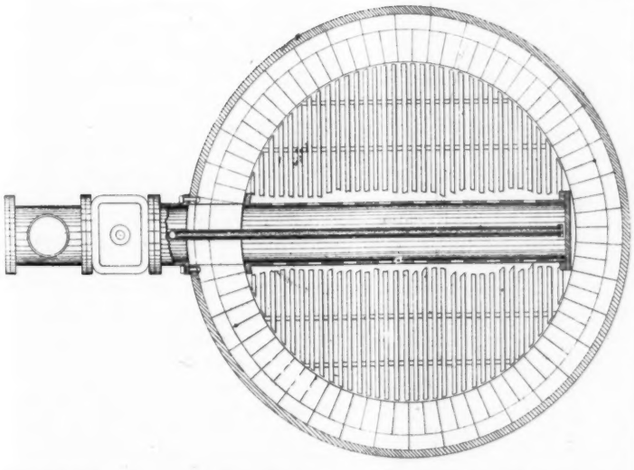
We have lately made another change in the Springer set which has resulted in great advantage. The diameter of the firebox was increased from 5 feet to 6 feet by reducing the lining—this without altering the lining of the superheater. The generator lining is now about 12 inches thick, one course on edge, the flat side against the shell, and one course of bricks butted against the outer course. The added area of the grate surface increased the capacity of the machine 50 per cent., while the increase in the area was 44 per cent. The only difference appreciable in increase of temperature on the outside of the shell was a raise from 100° F., which it had with the old lining, to 130° F. with the new. I claim no special advantage in this change excepting the increase of the capacity of the machine. Other changes which were made in the method of introduction of blast and steam I will speak of later in connection with the double superheater process.

Another important matter in the operation of the Springer was the deepening of the pit. As you know, the space between the grate bars and the foundation of the Springers, as they are usually erected, is a distance of not to exceed 2 feet. This limited space permitted constant condensation of steam, which caused the ashpit to contain water at all times, seriously interfering with the condition of the fire at the bottom. This ashpit was deepened in a cone shape to a depth of 3 feet, with the important result that condensation ceased and we were never again troubled with water, insuring a better condition of fire at all times.

With reference to the double superheater process, on its first operation we had, among other trials, difficulty in preserving a uniform condition of fire in the generator; also, trouble with excess of clinkering and with the burning out of channel ways in the lining. The idea was conceived by the President of our Company that some method other than that devised by the builders of the machine might result in lessening these objectionable features of operating. After some trials the method now in use in our works was introduced with astonishing results, not only in increasing the capacity of the machine, but in lessening the amount of coal and oil per 1,000 and doing away almost entirely with clinker. This device, which was introduced June 22, 1899, consists of 2 pieces of 16-inch pipe in the ashpit, 6 feet 6 inches long, with 12 holes, 3½ inches square, on each side of the pipe about 7 inches below the crown of the pipe, so that the ashes dropping have no opportunity of



Plan of Divided Blast and Steam for Water Gas Generators.



entering the pipe. Into this pipe was introduced a 2-inch steam pipe, perforated. The perforations in the steam pipe are sufficient in number to equal the full opening of the 2-inch pipe. The first result from this divided blast was observable when starting the machine cold. Three blasts of 25 minutes were sufficient to ignite the carburetter, while prior to its introduction as much as 6 or 7 hours were necessary. The openings in the 16-inch pipe for the blast and steam are slightly in excess of the area of the pipe itself; and the effect seems to be that, working under a blast pressure of 17 inches with Welsh coal, and 9 inches with Mexican coal, we have such a complete distribution of the oxygen through the fire that the coal burns down evenly in the entire mass. The fault of the ordinary method of introducing air had been that, at the point where the air impinged from the blast, the fire would burn down more rapidly than at any other, and clinker would surely form. Such is not now our experience. The effect of the blast seems also to create an increased velocity, formed, in my judgment, by the cushion of air at the end of the pipe upon which the successive blasts react in such a manner as to throw out the air through the port holes in more even volume, and with perhaps increased pressure on the fire. Before the introduction of this divided blast and steam, the economies of the machine could only be obtained at a minimum make per hour, but afterwards, with an increase in the make of 50 per cent., we were able to maintain the same economies of oil and fuel. As an evidence of the efficiency of this apparatus, I may say that we ran the generator for 7 months without drawing fire. The average operation of the machine with Welsh coal during these 7 months can be stated as follows: Blast pressure, 17 inches; nozzle pressure, 25 pounds; length of blast, 8 minutes; oil feed, 6 minutes; steam run, 8 minutes. A down run of steam was made 2 minutes in each run. The diameter of the grate surface of this generator is 7 feet, having an area of 38.484 feet. After 6 months running, Mexican coal was put in on top of the Welsh and run for about 1 month. I then drew the fire and found it in good condition; about 5 wheelbarrow loads of clinkers being the only result of this 7 months' run. The side walls showed little or no clinker; not more than 8 inches at the worst places. No channels were to be noticed on the brickwork. With Mexican coal I have found the very best results by the operation of 9 inches of blast pressure and a nozzle pressure of 15 pounds; length of blast, 7 minutes; length of oil feed, 4 minutes; steam, 7 minutes; and at every other run a down steam run of 2 minutes. These conditions have resulted in a very large saving of coal and oil over and above what it has been possible to do with Welsh anthracite. We are using a gas distillate of 24° B.

This divided blast has also been introduced in our Springer sets. It is there made of 12-inch cast iron pipe, and rests on the side walls of the ashpit; the holes being in the Springer about 9 inches from the grate bars and in the double superheater about 14 inches from the grate bars. The holes in the 12-inch pipe are 3-inch squares, 3 inches apart. In each case one end is butted against the blast pipe nozzle in the ashpit, and the other end closed with brick.

One particular circumstance in connection with this operation of divided air and steam has been the entire absence of naphthaline in and about the plant or in any of the services in the distributing mains.

In connection with the water gas sets, I desire also to call your attention to the very essential difference there is in the use of blowers. The first blower which was supplied with the plant (it being a volume and not a pressure blower) had a capacity for generating CO_2 in such quantities at times as to make it impossible to determine whether or not an illuminating gas of the kind required by consumers was being sent out, the amount being at times as high as 10 per cent.; this was with Welsh coal. The introduction of the second blower lessened the quan-

tity to an average of 3 per cent. My theory in connection with that phenomenon (if I may so call it) is that the space between the blades of the blower and the shell was so large in the first one that, while the volume of air, as shown by the pressure gauge, was the same in both cases, the effective pressure in the first one was not sufficient to carry the air properly through the fire and to permit of getting it in proper shape for the decomposition of the steam; while in the second blower the clearance between the blades and the shell was very much less and permitted apparently a greater pressure for the same volume.

There is one characteristic of the Mexican coal which makes it impossible to reduce the quantity of CO_2 as low as by the use of the Welsh, and that is that particles of coal in the generator, not being broken up as is the Welsh, present greater chances for the steam to pass by without being decomposed. If an attempt is made to overcome that by heavy blasting, it develops another characteristic, that of fusing, forming an almost impenetrable clinker having the consistency of pitch, and when cold becoming as brittle as glass.

There is one essential in the proper manufacture of water gas, and that is to have the steam as dry as possible. To that end the boilers should be near the generator. We had installed one of the porcupine type of boilers, which proved inefficient, because no matter how low the water ran (that is to say, a water line carried within limits of safety) the boiler would have a tendency to prime, although we were using the most approved type of separators, the water going over in volumes at times to flood the ashpit.

I have found the most effective method of charging the generators to be by hand, having exhausted all known methods of doing so by coal carriages and chutes, the intelligence of a man with a shovel being superior to that of any automatic device.

For the purpose of keeping in touch with the character of gas that is being made, we have a telephone connection between the photometer room and the charging floor, which is a distance of about 1,000 feet, where every half hour during the day a report is made of the photometer tests of candle power. This insures a steady and reliable character of gas during the whole run.

In our works also we are happily situated to this extent, that whatever hydrocarbons are deposited in the pipe leading from the relief holder to the purifiers can be taken up for the enrichment of the coal gas by passing the coal gas through the pipe when it is not being used for sending the carburetted water gas to the storage holders. The coal gas made averages perhaps not to exceed 12 or 13 candles, the exhauster of the coal gas being operated at an average of 2 inches of vacuum, and the gas is made from South Prairie coal without any enrichment. I have often sent down coal gas through the water gas main for a space of 6 hours, and the candle-power of the coal gas would be increased during that entire space of time to 25 candles. And the water gas main, when opened after such treatment, has been found to be clean and bright, excepting the usual deposits from coal gas.

To sum up. My experience of 15 years with the single and double superheater prompts me to this statement: That no man or series of men on the operating floor can be trusted to make their runs by any rule or any past experience, but that constant experiment with different kinds of coal and oil is the only possible method of achieving economy, and that constant watchfulness hour by hour, treating the machines as delicately as one would the finest piece of machinery, can only bring about the results which we are all anxious to show upon the balance sheets of the company's affairs.

Discussion.

Mr. Quilty—About what quantity of steam is required in making 1,000 cubic feet of water gas—either cost or number of horse power of steam, if it can be figured in that way.

Mr. Grimwood—In a paper [1] written, I think, for the 1899 meeting of the American Gas Light Association, on the subject of the consumption of steam in a water gas plant, this subject was thoroughly threshed out.

Mr. Quilty—Many claim that the principal cost is the coal and the oil, but I understand that quite a quantity of steam has to be decomposed.

Mr. Jones—The average fuel consumption for making steam is about 12 pounds per 1,000 cubic feet, in addition to the generator fuel.

The President—Ours run more than that; but I do not think the question of fuel enters into the matter. With Welsh coal the loss of screenings, deterioration from exposure to the weather, etc., produces a slack which is of no value. You must burn it up. You have coke screenings and ashes around the yard, and a surplus of oil tar that you cannot sell. It is unfair in most cases where you cannot use the residuals to make a charge for boiler fuel. With us the fuel average is about 14 pounds.

Mr. Jones—We have no refuse. We are making coke to make water gas, and are at present so situated that we have to use fuel, and must know how much it costs. I cannot afford to sell coke because it is worth $8.

The President—We are reaching that point by the use of Mexican coal, which leaves very little residual.

Dr. Powers—Just a suggestion. Passing along the water front one day I noticed a large heap of "abalone" shells, such as they gather to polish. At that time we were using Cerrillos coal in the generators and were very much troubled with clinkering. I suggested using a load of the shells. Since that time we have had no trouble. I should say that pure limestone used in the same manner with the coke would do away with the clinkering. The action is purely mechanical. It burns in the generator and forms lime.

Mr. Lowe—The consumption of boiler fuel is not quite so favorable in small works. The extra boiler fuel used to generate steam in water gas sets, in addition to the screenings and tar, amounts to about what 20 pounds of coal would cost. Most of the works use some fuel other than coal. In the small works, if coal were used, the average throughout the State, generally speaking, would be the equivalent of 20 pounds of coal. I have had a great deal of experience in the matter of Dr. Powers' suggestion. In the East, once a week we took oyster shells or limestone, spreading them around the walls of the generator. As the fire went down it fluxed off the clinker. The great danger in that experiment is in getting too much. You could readily melt off your brick. The action is the same as in blast furnace practice. Don't use too much.

Mr. Pedersen—I might say that in Marysville at the time the plant was installed they were making from 25,000 to 30,000 feet of gas per day maximum, and we figured out that the oil for fuel purposes amounted to ⅛ of one gallon per 1000. They also used what little screenings they raked out of the generator.

The President—In the matter of the divided blast shown on the plan, the claim was not made that it did away with clinkering, but that it effected an increase in the capacity of the water gas machine. I know, from a system of trials, that before the introduction of the divided blast the capacity of the machine at an economic point could not be over 28,000 feet per hour. The moment that was introduced an economic point of 42,000 feet was reached. The experience has been the same with the Springer. It eliminates naphthaline entirely. We cannot make it if we want to; why I don't pretend to say. Besides the extreme evenness of the fire should be taken into account. It used to burn in all kinds of shapes. I do not claim any particular originality for the idea. I saw something like it of a modified form in Chicago, not at all upon the same principle, but reaching the same results in another way. The cost is about nothing. The device consists of a piece of 12-inch pipe, 7 feet long, and to put it in position would not require more than the labor of one man half an hour. In our works it has increased our capacity and has saved us money in actual dollars and cents.

Mr. Quilty—Is the pipe of cast or wrought iron?

Mr. Beck—Cast; but wrought iron could be used.

Mr. Pedersen—We tried the blast pipe at North Beach with the Pacific Gas Improvement Company, where I had trouble about getting up the capacity. Even with the blast pipe we did not reach the capacity attained in Oakland, which is over 1,000,000 feet per day. We did not reach over 900,000. I attribute the difference to the boiler. At North Beach the boilers are over-worked, and I presume we got wet steam. I believe you put in a new boiler about the same time, which possibly aided you in increasing the capacity.

The President—We ran with the old boiler for quite a time.

Mr. Jones—I believe one difficulty is that generally the smallest pipe is the outlet of the generator, although the gas at that point is expanded to nearly double its cooled volume. The outlet from the generator should be the largest pipe in the gas works.

Mr. Lowe—It seems to have been the practice of the builders of water gas works to throttle the outlet of the generator. I never could understand it. If they could put in as large a stack valve as the whole opening, it would be better. The more oxygen you get into contact with your coal the better it will be. That by holding back the products of combustion in the generator a retention of heat is gained is a ridiculous notion. No cook, if she wanted to get a quick fire, would close her damper. The same thing applies to a water gas generator.

Mr. Papst—I have had a peculiar experience in regard to the running of one of the old sets. We found that the resistance on the outlet was

1. See JOURNAL, Oct. 23, 1899, p. 652: "The Steam Consumption in a Water Gas Plant," by Mr. Alten S. Miller.

practically zero. You can blast up the set in four minutes. It shows how quickly the machine heated up.

Mr. Gregory—You often get a resistance not in the construction of the machine. The stack will stop up a little, and many operators do not know it. They run the fan fast and drive more air through the generator. If you shut off the opening ahead you simply shut off the power of the fan. The fan cannot work without an opening, and the more it is closed up the less heat you will get in your generator. I have found it necessary to close down and clean the stack.

Mr. Pedersen—It is not always a question of the amount of air that you get through the machine. With Mexican or Cerillos coal we used 9 inches of blast pressure; you cannot use more. That is ample for the purpose of getting oxygen through the fire. With Welsh coal it is necessary to run the blast up to 15, 16 or 17 inches on account of the density of the fuel, which is just like sand. The amount of air must be graduated according to the fuel.

Mr. Jones—The reducing of the resistance will amount to the same thing in each case, because the economy in time means increase in the capacity of the machine.

Mr. Gregory—Where you are using a dense coal it is better to relieve it by using English coke or something of the sort. No matter how you shut off the air blast, the fan will run on and not drive in the air.

Mr. Lowe—The pressure on the blast pipe is no indication of the amount of air going through it.

The President—I think Mr. Beck sized up the question when he said it is simply a matter of undivided attention on the part of the gas maker.

Mr. Pedersen—Can you describe how you keep track of the operation of the gauges?

The President—That was submitted at our last meeting in the form of Bristol charts showing the hourly operations.

Mr. Osborn—I was pleased with Mr. Beck's statement that it depends upon the heat. I have in mind one place where the gas maker was having considerable trouble. I changed the man, and the set went off in perfect order. The trouble was that the operator was color blind. He was not able to distinguish heat.

The President—An old employee of ours named Souter ran the Springer set for a number of years and became so well trained that I believe photometrical measurement would not have come to within 4° of what he would guess at by the sound of the blast. He would not go by any rule of minutes, but would close the stack valve when he heard a certain sound.

Mr. Lowe—I am in favor of no rule-of-thumb method of operating water gas plants. Every man has a certain method which gives him the best results. One man in my employ tells the working of his oil burner by the sound. He cannot tell in any other way; but he can run a gas works better than I can.

Mr. Quilty—We are firing 7 boilers with oil, and the fireman tells me that if anything goes wrong he gets it with his ear. He cannot see the fires.

The President—In our electric light station at night, when there have been 30 machines going, I have seen the experiment tried of dropping a 6-penny nail on the floor and having every man in the place turn around. It simply shows what men become accustomed to.

Mr. Holberton—One thing occurred to me in reference to the refuse from the coal used in making water gas. You say you don't charge up fuel for the boilers due to the fact that this refuse exists for which you have no use, but that with some of the newer coals you do not have any refuse. Some one said that it was necessary to burn oil. Would it not be well to consider the practice of the continental gas companies of using auxiliaries driven by gas engines?

The President—We have to have steam for water gas.

Mr. Grimwood—I think something of the sort has been tried at our North Beach Station, where we are running coke crushers with a gas engine because our boilers are running on a full load.

Mr. L. P. Lowe read the following paper on

PRACTICAL TESTING OF OILS FOR GAS AND FUEL PURPOSES.

One of the all-important questions touching the successful management of any industrial or manufacturing concern is a clear and comprehensive knowledge of the quality of materials used in connection with the daily operation of the work.

To the gas manager this means a precise knowledge of the materials used in connection with gas making; to the steam user, a knowledge of his fuels, etc.; and while there is but little doubt that one usually gets the quality of materials ordered when dealing with established, reliable concerns, there is yet a great degree of satisfaction in knowing, from personal observation, that there is actually received that which is paid for.

To the gas men of the Pacific Coast, be they advocates of coal, water or oil gas, no subject is of more importance than that of a suitable oil supply, that article entering largely in all kinds of gas manufacture, not excepting coal gas, for which it is used as an enricher and for firing benches and boilers.

In Eastern localities it is not necessary to pay such strict heed to the quality of gas-making oils, as there are but few kinds in use, practically but two, one of which is the natural crude oil, of comparatively light gravity and good quality, and the other a distillate commonly known as "gas oil," both being well suited for gas manufacture.

The present oil supply of the Pacific Coast is, however, a very complex proposition, it being almost an impossibility to imagine a substance of that kind which can be more refractory and difficult of manipulation than some of the numerous grades of California crude oils. But these oils are exceedingly valuable, the development and recovery of which form now one of the leading industries of the West, and a boon to fuel users in general, as they largely regulate the cost of coals, which would otherwise be much higher in price than they are now.

Of the crude oils of California but a very small proportion are of light quality, by far the greater amount being exceedingly heavy, because of their large percentage of contained asphaltum, and such oils are also apt to contain considerable amounts of water and dirt, often running as high as several per cent., without being noticed in casual observation, as the water, in such heavy oils as 12° to 16° B., does not as easily sink to the bottom as would be supposed, but remains in suspension, in minute drops throughout the body of the oil, probably inclosed in microscopic capsules of asphaltum, thus easily escaping detection, as is also frequently the case with very much lighter oils.

It is the custom of some large dealers to store their crude oil in what are called settling tanks, where it remains sufficiently long to allow much of the suspended dirt and water to fall to the bottom, such stored oils being guaranteed to contain not more than 1 per cent. of foreign matter; and while this is no proof that such a degree of purity is attained, it enables the purchaser to make a deduction for any amount of dirt or water found in excess of the 1 per cent. guaranteed.

There are but few dealers who use such settling tanks, and those who do generally ask a somewhat higher price for their oil. Those who do not are, however, just as willing to guarantee their products and allow deductions for any excess foreign substance.

From the foregoing there will be seen the importance of systematic oil inspection and testing and, therefore, the value of practical, ready means of determining the physical purity of all such materials.

While the chemical composition and relative proportions of the constituents of oil are of interest to us all, and especially so to the inventor and close investigator, for general practical purposes a knowledge of the gravity of oil and its physical impurities is all that is necessary for ordinary use, both of which are important and should be generally understood. It may, however, be well to state that, generally speaking, the ultimate composition of crude oils is usually assumed as being about 85 per cent. carbon and 15 per cent. hydrogen by weight, or what is probably a more nearly correct analysis of such an oil free from foreign substances, 84 per cent. carbon, 14 per cent. hydrogen and 2 per cent. oxygen; and in theoretical calculations of the evaporative efficiency of crude oils one or the other of the above sets of figures are used in the absence of knowledge of the exact composition of the oil under examination.

Personally, the writer has not as yet been able to secure an ultimate analysis of any of our California oils which he deems reliable, and is not, therefore, aware of their exact composition; but he thinks, while the figures given will apply in a general way, he would rather expect the heaviest of those oils to contain a somewhat greater percentage of carbon and proportionately less of the other constituents.

An ultimate analysis of an oil should not be confounded with a mere distillation test, as they are totally different and bear little or no relation to one another, the distillation test being of especial value to the oil refiner but to a less degree to the fuel user. The gas maker, however, derives much practical information from a distillation test, for it informs him as to the ease with which any particular oil can be volatilized and converted into gas, and also gives him an idea of the amount of residuum which can be expected in the way of what we term "oil tar" in gas manufacture.

California oils are, as a rule, of that kind known as having an asphaltum base. That is to say, upon driving off the lighter oils by distillation, the residue or base remaining is of an asphaltic nature, and it is principally the varying proportion of this material which makes the

difference in the gravity of our local oils, some being quite light while others are extremely heavy, the lighter grades being, of course, the best for gas enriching purposes, though the heaviest are also successfully used in the manufacture of an excellent quality of illuminating gas.

Throughout the foregoing the writer has used the popular term "gravity" in referring to oil, though, strictly speaking, the term is a misnomer, the use of which should be discontinued, as the uninformed are apt to confound or associate it with "specific gravity," which has a totally different meaning.

It would unquestionably be more sensible to designate oils by their actual specific gravities, that is to say, by their weight as compared with an equal volume of water under standard conditions; but for some reason the accepted gravity test for oil is an arbitrary one known as the Beaumé scale, which begins its registration for liquids lighter than water, with 10°, that being the reading for water on the Beaumé scale.

For testing the grade of oils by the Beaumé method an instrument known as a hydrometer is used. It is made of glass and somewhat resembles a thermometer, though graduated, of course, in degrees Beaumé. In using this instrument it is only necessary to carefully place it in the oil to be tested, allowing it to come quietly at rest, when the reading of the hydrometer at the surface of the liquid at once indicates the degrees Beaumé, or, as it is popularly called, the "gravity" of the oil, provided that during the operation it has been at the standard temperature of 60° F.

Should the temperature have been more or less then 60°, which can be ascertained by testing with a separate thermometer if desired, a correction becomes necessary to determine the grade of the oil, corresponding to 1° Beaumé for each 10° difference in temperature, deducting for a too high and adding for a too low thermometer reading. For instance, if the hydrometer showed a reading of 20°, and the thermometer showed the temperature to be 70°, the true grade of the oil would be but 19, while, if the temperature were but 50°, the grade would be 21. A very convenient form of hydrometer is one having a thermometer and temperature correction scale attached. It adds somewhat to its bulk, but nevertheless is to be preferred to two separate instruments. It is well, in purchasing a hydrometer, to secure a standardized or guaranteed instrument, which, though costing somewhat more than the ordinary kind, can be relied upon as being correct.

The testing of light oils, such as Coalinga and the like, is a very simple operation, as the hydrometer quickly finds its resting place, and reading can be made after allowing a few moments for the thermometer to acquire the temperature of the fluid under examination, but in testing very heavy oils it is necessary to allow a considerable time to elapse before the instrument will fully settle to its proper place.

Probably a better method of testing these heavy oils is to first suspend the hydrometer in a testing jar or cylinder, using a thin thread for that purpose, then slowly and carefully filling the jar until the hydrometer floats, after which the thread can be nipped off close with a pair of scissors and the reading be then made. It is a question, however, if the the gravity of a heavy oil is ever accurately determined by the use of a hydrometer, owing to the great viscosity of the oils, some of which are so particularly thick and difficult to handle that other methods of determining their gravity must be employed, of which the three following are easily handled and may be found useful:

1. Heating the oil to cause suffieient fluidity for a test and making subsequent corrections for temperature, though this method is practical to but a limited extent.

2. Mixing thoroughly a given quantity of the heavy oil with a like amount of a lighter oil of a known specific gravity, such as gasolines, and then testing the specific gravity of the mixture, from which data can then be be calculated the specific gravity, and ultimately the degrees Beaumé of the heavy oil used.

This method requires the use of a hydrometer graduated for specific gravities, or if only a Beaumé hydrometer is at hand, a set of conversion tables for use in connection therewith, and to which references will be made later.

3. Suspending a drop of the heavy oil in an experimental mixture of alcohol and water, and afterwards testing the grade of the mixture, which necessarily corresponds with that of the oil.

In performing this latter test a single drop of the oil is placed in a tube containing alcohol, in which it will be found to sink and rest upon the bottom in a globular form. Water is then slowly added and well mixed with the alcohol by gentle stirring, until, by carefully moving the drop of oil, preferably with a small glass rod, it will remain suspended in any portion of the mixture, thus showing it to be of like weight. The mixture of the alcohol and water is then tested to determine its gravity, which, of course, corresponds with that of the oil.

This method has the advantage of being able to be worked with as small a quantity of oil as a single drop. Care must be used, however, to see that no air bubbles form and cling to the oil, as they will very materially tend to float it, and thus give rise to errors in the ultimate reading.

While the scientific determination of the specific gravity of an oil, as with any other substance, would be determined by accurately weighing it on a sensitive specific gravity balance, that method is not applicable for ordinary use, and the foregoing covers the practicable methods used.

The following description of a test for determining physical impurities, such as water and dirt, is a simple and efficacious method, and is known as the gasoline test. It is performed as follows;

Procure a glass cylinder having a capacity of 100 cubic centimeters, graduated in either single or one-half c.c. divisions, the cylinder being closed at the top with a cork, or preferably a ground glass stopper. Into this cylinder place exactly 50 c.c. of gasoline, such as is used in ordinary gas machines, and which is readily procurable at any drug store. Then into the same cylinder carefully pour the oil under examination until it and the gasoline reach to exactly the 100 c.c. mark, thus giving a mixture composed of equal volumes of the two substances. Then insert the stopper and shake well to insure thorough mixing of the crude oil and gasoline, thus making a comparatively light weight emulsion, after which place it away and allow it to quietly settle for, say, 24 hours, when, upon examination, it will be found that the water and dirt, if there were any in the sample of oil used, will have separated from the emulsion and settled to the bottom of the testing cylinder, where it can at once be read off in direct percentage by volume. For instance, if one-half c.c. were the graduations of the cylinder, each division would be 1 per cent. of the amount of oil used for the test, while if the graduations were but 1 c.c. then each division would be 2 per cent.

The exact amount of oil can, of course, be first placed in the testing cylinder if desired, and the gasoline added, in which case it is not necessary to carefully adjust the quantity of gasoline, the important point being to have the amount of oil exact; but it is preferable to add the oil slowly to the gasoline with frequent shaking, as it is then more quickly and completely mixed.

The action of the gasoline is purely physical, although it performs two important functions, in that it not only makes a light weight emulsion through which suspended sand and other foreign substances can easily fall, but it also dissolves what seem to be capsules, probably of asphaltum, and which contain minute quantities of water. The distension of these capsules, under the action of the gasoline, is enormous, the writer having frequently observed them as large as small sized peas. They sometimes collect at the bottom of the emulsion, and can be broken by violently shaking the mixture, after which it is allowed to resettle when the reading can be made.

The cylinder most likely to be found in stock at ordinary dealers is the one having a capacity of 100 c.c. with 1 c.c. graduations. These divisions are, however, sufficiently far apart to enable readings to be made to as close as ½ per cent. of any existing impurity.

It seems unnecessary to state that a cylinder with almost any scale of graduations, and of any capacity, can be used for this purpose, by making proper calculations conforming therewith, but the one described above will be found to be the most convenient.

Tests for gravity and purity are the ones likely to be most used, and which will be found of value in constant practice, but it must be understood that they are in no wise an indication of the composition of an oil, being merely a guide as to its comparative gravity and physical purity.

For a knowledge of the composition of oil, fractional distillation and combustion must be resorted to, a description of which process is beyond the scope of this article, but in closing it may be of interest to refer to a deception sometimes practiced by unscrupulous oil dealers in the disposal of their products.

Commercially considered, the most valuable products of crude oil distillation are ordinary kerosene and lubricating oils, and as these are middle oils, there must first be driven off the light oils, amongst which are those having the trade names of "gasoline," "naphtha," etc., before the "kerosenes" and lubricants can be recovered, after which there remains a substance commercially known as "residuum," the value of which depends upon its composition.

It frequently happens that the light oils and residuum are not of much value separately, in which case they are often mixed into a compound closely resembling the original crude oil and are readily sold as that article, as they can be made to have identically the same appearance and gravity by being mixed in the proper proportions, but such a

mixture, while it makes an excellent fuel, is of indifferent value to the gas maker, the most useful of its constituents for his purpose having been removed with the extraction of the kerosene and lubricants.

This deception is well worth bearing in mind, as it may some day account for a sudden and unexplainable difference in gas making results.

In the examination and use of oils it is frequently essential to have a more extended knowledge of same than is given by the hydrometer alone; for instance, a knowledge of the actual specific gravity as scientifically understood, may be desired, and it will also frequently be found convenient to know the weight per gallon of an oil of either a given specific gravity or degree Beaumé, and accompanying this paper is a table giving all of this information.

It is also quite necessary, in the accurate measurement of oil, to make corrections for any temperature greater or less than the standard one of 60° F., as the expansion or contraction of the volume of oil for temperatures higher or lower than the standard is considerable. A percentage table for the temperature correction also accompanies this paper, and its use in accurate work is advised, and it is necessary to heat the heavy California crude oils to quite a high degree, say from 120° to 150° F., before they can be easily handled by pumping in the usual manner, and at a temperature of 150° the oil is expanded almost 6 per cent. by volume.

Table of Beaume's Hydrometers with Corresponding Specific Gravity, and also the Number of Pounds Contained in 1 U. S. Gallon at 60° F. for Liquids Lighter than Water.

Beaume.	Specific Gravity.	Pounds in Gallon.	Beaume.	Specific Gravity.	Pounds in Gallon.	Beaume.	Specific Gravity.	Pounds in Gallon.	Beaume.	Specific Gravity.	Pounds in Gallon.
10	1.0000	8.33	30	0.8750	7.29	50	0.7777	6.48	70	0.7000	5.83
11	0.9929	8.27	31	0.8695	7.24	51	0.7734	6.44	71	0.6965	5.80
12	0.9859	8.21	32	0.8641	7.20	52	0.7692	6.41	72	0.6930	5.78
13	0.9790	8.16	33	0.8588	7.15	53	0.7650	6.37	73	0.6896	5.75
14	0.9722	8.10	34	0.8536	7.11	54	0.7608	6.34	74	0.6863	7.72
15	0.9655	8.04	35	0.8484	7.07	55	0.7567	6.30	75	0.6829	5.69
16	0.9589	7.99	36	0.8433	7.03	56	0.7526	6.27	76	0.6796	5.66
17	0.9523	7.93	37	0.8383	6.98	57	0.7486	6.24	77	0.6763	5.63
18	0.9459	7.88	38	0.8333	6.94	58	0.7446	6.20	78	0.6730	5.60
19	0.9395	7.83	39	0.8284	6.90	59	0.7407	6.17	79	0.6698	5.58
20	0.9333	7.78	40	0.8235	6.86	60	0.7368	6.14	80	0.6666	5.55
21	0.9271	7.72	41	0.8187	6.82	61	0.7329	6.11	81	0.6635	5.52
22	0.9210	7.67	42	0.8139	6.78	62	0.7290	6.07	82	0.6604	5.50
23	0.9150	7.62	43	0.8092	6.74	63	0.7253	6.04	83	0.6573	5.48
24	0.9090	7.57	44	0.8045	6.70	64	0.7216	6.01	84	0.6542	5.45
25	0.9032	7.53	45	0.8000	6.66	65	0.7179	5.98	85	0.6511	5.42
26	0.8974	7.48	46	0.7954	6.63	66	0.7142	5.95	86	0.6481	5.40
27	0.8917	7.43	47	0.7909	6.59	67	0.7106	5.92	87	0.6451	5.38
28	0.8860	7.38	48	0.7865	6.55	68	0.7070	5.89	88	0.6422	5.36
29	0.8805	7.34	49	0.7821	6.52	69	0.7035	5.86	89	0.6392	5.33
..	....	..	..	....	..	..	....	..	90	0.6363	5.30
..	....	..	..	....	..	..	....	..	95	0.6222	5.18

Temperature Correction Table for Oils.—Divide apparent volume by number opposite temperature.

Deg. F.	Deg. F.	Deg. F.	Deg. F.
45.... .99040	72....1.00768	99....1.02496	125... 1.04160
46.... .99104	73... 1.00832	100....1.02560	126....1.04224
47.... .99168	74....1.00896	101....1.02624	127....1.04288
48.... .99232	75....1.00960	102 ...1.02688	128....1.04352
49.... .99296	76 .. 1.01024	103 ...1.02752	129... 1.04416
50.... .99360	77....1.01088	104 ...1.02816	130....1.04480
51.... .99424	78....1.01152	105 ...1.02880	131....1.04544
52.... .99488	79....1.01216	106....1.02944	132....1.04608
53 ... .99552	80....1.01280	107....1.03008	133... 1.04672
54.... .99616	81....1.01344	108....1.03072	134....1.04736
55.... .99680	82 .. 1.01408	109....1.03136	135....1.04800
55.... .99744	83 ...1.01472	110....1.03200	136 ...1.04864
57.... .99808	84 .. 1.01536	111 ...1.03264	137 .. 1.04928
58.... .99872	85....1.01600	112 ...1.03328	138....1.04992
59.... .99936	66 ...1.01664	113....1.03392	139....1.05056
60....1.00000	87....1.01728	114....1.03456	140 ...1.05120
61....1.00064	88....1.01792	115....1.03520	141 ...1.05184
62....1.00128	89....1.01856	116....1.03584	142 ...1.05248
63... 1.00192	90....1.01920	117....1.03648	143 ...1.05312
64....1.00256	91....1.01984	118....1.03712	144....1.05376
65....1.00320	92... 1.02048	119....1.03776	145....1.05440
66....1.00384	93... 1.02112	120....1.03840	146....1.05504
67....1.00443	94....1.02176	121....1.03904	147....1.05568
68....1.00512	95....1.02240	122....1.03968	148....1.05632
69....1.00576	96 ...1.02304	123....1.04032	149....1.05696
70....1.00640	97....1.02368	124....1.04096	150....1.05760
71....1.00704	98....1.02432		

Should any member desire separate copies of these tables, it will give the writer pleasure to supply them.

Discussion.

The President—That paper is exactly what it started out to be—practical. It contains a great deal of information for gas men, especially for the men who have to use these oils. I can see in it a great deal of profit for the Association. It is what most of our papers, I am proud to say, aim to be. They do not take upon themselves highly technical characters to alarm and afright the ordinary gas man, but they deal with his everyday affairs.

Mr. Gregory—Do I understand that you should use gasoline mixed with the oil for testing sand or sediment in the oil?

Mr. Lowe—Yes. It is solely for the purpose of making a heavy oil light so that it will precipitate.

Mr. Gregory—Would you use 60° gasoline or a higher grade?

Mr. Lowe—It does not make any great difference, but I prefer to use a higher grade because it is a better solvent. I never try anything of a poorer grade than the best I can buy. I was very much surprised to find that some gasoline purchased at one of the best drug stores in San Francisco was only 71°. But the gasolines you purchase in drug stores are good enough to act as solvents on the asphaltum in the oil and break it up. The dirt and sand in the oil will fall through quite readily; but it may contain several per cent. of water. I had a sample of Los Angeles oil of 12° gravity that had stood for a year. When I mixed it at the end of that time to test it for impurities I found that it contained 19 per cent. of water. I did not believe that it was possible, but in subsequently studying the matter I found that the water was contained in little corpuscles. I discovered that accidentally in making a reading, observing these bead like forms on the line of the water and oil. By breaking them I got a great percentage of water.

Mr. Grimwood—I think you would find some difficulty in getting 84° gasoline at a drug store. If you went to the druggist and asked for gasoline, under the impression that you were getting 84° gasoline, you would get about 72°. If you go to a drug store and ask for 84° gasoline, the chances are that he will tell you he cannot supply it.

Mr. Lowe—That is very likely so. In purchasing gas machines we get 82°, 84° and 86° gasoline. That is the ordinary gasoline used in the house-lighting machines. When you get down in the seventies, it does not work very well; 74° is what is used in gasoline stoves and in engines.

Mr. Grimwood—I do not think any druggist would dare to send out 84° gasoline without marking it dangerous. And I am under the impression that very few members have ever seen an 84° gasoline. Testing the gravity of oil with alcohol is one of the most convenient ways, and I want to draw attention to a particular detail in regard to the manipulation of the test. Mr. Lowe speaks of putting a small drop of oil into the cylinder and adding water to the alcohol. My experience has been that it is difficult to get a good mixture. The method I have adopted is to take the mixture and make up about what I think would be the gravity of the oil; then pour a small portion of it into a test tube; and if I found that it was too heavy or too light, then I doctor my mixture accordingly.

Mr. Lowe—I am inclined to think that would be better. The trouble I have found is the great tendency of air bubbles to cling to the drop of oil. Your method would do away with that trouble.

Mr. Jones—I was pleased to see Mr. Grimwood try that experiment. I never realized the difficulty of mixing water and alcohol before.

Mr. Grimwood—In testing for impurities in crude oils, the gasoline test is a good one, but I think you have to guard against one error. If you use too much or too light a gasoline you get a precipitate of asphaltum, which is not an impurity in the oil.

Mr. Lowe—Would 50 per cent. of the crude oil and 50 per cent. of gasoline be too much?

Mr. Grimwood—No. Unless you use a light gasoline I think it would be perfectly safe. I have had that happen to such an extent that I could not take the reading of the amount of water precipitated.

Mr. Britton—The Standard Oil Company, in purchasing oils from the different wells, provides for a test of 50 per cent. gasoline and 50 per cent. of the oil.

Mr. Grimwood—I think it is well to specify the amount and gravity of the gasoline in making a test.

ROUTINE BUSINESS.

The President—By the courtesy of Mr. Jones, the stations of the San Francisco Gas and Electric Company have been opened to all the members of the Association at this time, and he states that he would be de-

lighted if you would visit the works while you are here. Mr. William Casey, of San Francisco, was unable to prepare his paper on "Gas Engines," owing to troubles connected with the strike. The Question Box did not provoke any questions, but I think enough have been asked to answer for all. I will announce the appointment of the following committees:

Library.—Messrs. E. C. Jones, L. P. Lowe, Geo. C. Holberton, and, by request of the Association, Mr. Britton.

On Gas Engineering Proposition.—Messrs. T. R. Parker, C. W. Quilty and J. B. Grimwood.

Editor Wrinkle Department.—Mr. Geo. S. Colquhoun.

Editor Experience Department.—Mr. O. M. Gregory.

Mr. Jones—It seems to be the desire of our Northern members that the date of meeting should be changed.

The President—I would suggest that the matter be left in the hands of a committee, with power to act. I believe that if it is left to the wishes of the majority of the members it will be impossible to get an expression.

On motion of Mr. Lowe, it was voted that the matter of changing the date of the meeting be left to the incoming Board of Directors, with power to act.

VOTES OF THANKS.

On motion of Mr. Pedersen, it was voted that the thanks of the Association be extended to Mr. A. W. Foster, for his courtesy in tendering the Association the use of the grounds at Lagunitas.

On motion of Mr. Parker, a vote of thanks was extended to the San Francisco Gas and Electric Company for its entertainment of the Association in this and in past years.

Mr. Lowe—We cannot adjourn without thanking our President and our Secretary for the very excellent work that they have done. The duties of the Secretary are becoming very burdensome. All that we can do is to thank them from the bottom of our hearts for the work they have done. Therefore, I move that a vote of thanks be extended to the President and Secretary. (Adopted.)

The President—To me it is a time of pleasure and at the same time one of regret. For the first time in years I lay down the toga of office; that is the regretful part of it. The pleasurable part is that I am enabled to introduce as my successor one who will well carry on the work. I know that the next meeting will be the peer of this one. Every meeting of the Association has been a little better than the one which preceded it, both in attendance, enthusiasm and general spirit of the members. It is going to be the same hereafter. With my grateful appreciation to you all for your splendid attendance and attention, I now retire from this office with a great deal of satisfaction to myself and, I trust, to you. I will now introduce my successor, Mr. Charles E. Burrows.

Mr. Burrows—Gentlemen, in accepting this position I do so with a great deal of trepidation and fear that I shall not meet your expectations. However, to the best of my abilities I will perform the duties of the office. One thing against my success is my location, being so far from the point of meeting and from the offices of the Secretary and of my fellow officers. Mr. Osborn will be called upon for pretty active work in lieu of the President, because he is so much nearer the scene of action.

Mr. Osborn—Mr. President and Gentlemen: When I joined this organization as a charter member I had an ambition to some day fill the position to which you have just elected me. I was not long, however, in discovering my total unfitness. I must say that I am deeply grateful to you all for allowing me, by association with you, to prepare myself, in your judgment, to fill this honorable position. I thank you.

The meeting was then declared adjourned.

Modern Methods of Distributing Gas.[1]

By MR. NORTON H. HUMPHRYS.

Up to a comparatively recent date, the whole of the motive power for distributing gas was invariably provided by one apparatus—the exhauster. Though the name of this appliance infers that it acts as a puller rather than as a pusher, and that its function is to draw the gas away from the retorts, its real duty is that of raising the pressure to a sufficient degree to enable the gas, not only to get into the holders, but to travel to the farthest parts of the district. The gasholder is usually credited with doing the work of distribution. But it has no more claim to this than the accumulator on a hydraulic power apparatus has to being the source of the power. The exhauster has to force the gas through the washers, scrubbers, purifier and meter, and then to send it into the holder. The strap or the crank that actuates the exhauster represents the whole of the mechanical power applied to the work of distributing the gas; and the exhauster, rotary pump, blower, or whatever we call it, still remains the real motive power. We may put it where we like, between the inlet to the generating apparatus (if there is one) and any suitable position on the distribution system; but the result is the same. We rely on the rotary pump as the means of distributing the gas.

In large modern works, however, we frequently find that the gas passes through a second, or even a third, pressure raising apparatus, before it reaches the users. One pressure raising operation, and that at the outlet of the condensers, is usually considered sufficient. But there is a tendency to divide this work into two stages, by taking the gas in hand at the inlet of the holder, or by using light holders and increasing the pressure at the outlet. The pressure required for distribution, in contradistinction to that necessary for passing the gas through the purifiers and meter on the works, forms a natural division of the subject into two stages.

A Sturtevant blower worked by a Westinghouse gas engine, and used for transferring gas from a lighter to a heavier holder, was an interesting item on the occasion of the visit of the Southern Association of Gas Engineers to the Bournemouth gas works in June last. Pressure raisers have for some years past been employed by the Gas Light and Coke Company in connection with their system of high pressure trunk mains, for conveying gas supplies a distance of several miles. From these operations it is not a very wide step to taking the gas in hand at the outlet of the station meter by means of a pressure raising apparatus, thus allowing the pressure at that point to fall to zero, and enabling lower pressure to prevail in the purifier house—the advantage of which is obvious. And this, in its turn, suggests that there is no reason why the whole of the gas supply must necessarily pass through the holders, and that some considerable proportion (perhaps the bulk) might be sent direct to the consumers. With continual improvements in the reliability and efficiency of blowing machinery, the simple but costly holder may be largely displaced by mechanical distribution, as it must be if supply pressures greater than a few inches of water should come into use.

The idea of even partially dispensing with gasholders is so much opposed to established practice that those who have been trained in, and are accustomed to, the ordinary routine of coal gas manufacture, are inclined to regard it as being outside the range of practical politics. The good old rule of a maximum 24-hours' storage still has its adherents. The gasholder certainly belongs to the class of apparatus and individuals that is "willing to make itself generally useful"—now growing smaller by degrees and beautifully less. Under ordinary circumstances it covers at least three distinct requirements. It is a reserve against a sudden and unforeseen overtaking of the production by the demand, enabling the manufacturer to keep several hours ahead, and to guarantee a full pressure in the mains from one year's end to another. It not only stores the gas, but also stores distributing power received from the exhauster, resembling in these respects the accumulator used in connection with hydraulic power apparatus. It further acts as a mixing chamber, not only keeping up a continual supply, but also a uniform quantity at the outlet, independent of considerable variations in the inlet quality from minute to minute or from hour to hour. Altogether, the gasholder is regarded as indispensable; and no gas engineer of experience would trust to one holder. Even in the smallest works we find at least two, so arranged that one can be always in use.

The means by which the gas is generated must of necessity have a great effect on the amount of storage required. If we had a system that could be relied upon to produce a constant quality of gas, unvarying from minute to minute, adjustable as regards quantity between the maximum and minimum rates of consumption, and, further, had our purifying arrangements so efficient as to take care of the maximum rate of production and avoid all risk of supplying impure gas, the question of storage might become indeed unimportant. But the methods of generating gas at present in operation are confined to two—the retort and the cupola. Although there are many so-called processes for making gas, they all come down to one or the other of these; and one is reminded of the thousands of "patents" that have been taken out in connection with such a simple operation as the generation of acetylene.

The retort takes about three days to get into working order, starting cold. When put to work, it is very stiff and inelastic as regards production, and cannot be allowed to stand idle without damage. It has one fixed rate of production, which may be 5,000 or 10,000 cubic feet per 24 hours, according to the size and description of setting used, which

1. *Journal of Gas Lighting.*

must be adhered to within a margin of 10 per cent. either way. Thus a considerable portion of the storage capacity is occupied in taking care of the variations in demand on an inelastic and saltatory production. It is better to have a good margin of storage, so that the retorts in use may be kept in steady work—not standing idle on the one hand, or being forced or strained to meet an increased demand on the other. Given an ample storage margin, the manager of the works can arrange the number of retorts in use according to the season of the year, in such a way as to meet these conditions. With the retort there is also a variation in yield and quality throughout the working of the charge. But this objection is neutralized by the fact that it is a very small unit, and a considerable number must be in operation. By charging in rotation, it is easy to work in such a manner that both quantity and quality of gas produced are fairly regular at the outlet from the foul main.

The cupola, as usually worked, with alternate blows and runs, brings in quite a different state of affairs. It possesses some elasticity, as the rate of production per 24 hours can be varied considerably without violation of economical conditions; it admits of a certain amount of standing idle; and it can be put into operation in a few hours. But there is a larger variation in the rate of production, and also in the quality. The gas is made in spurts, instead of in one even flow; and the cupola is a comparatively large unit. To put a sufficient number into operation to insure a regularly steady production from minute to minute, is rather a large order; and sometimes the use of subsidiary storage in the form of a relief holder becomes necessary, in order that the gas may be reduced to one steady, even flow for the purpose of purification. While the water gas cupola diminishes the importance of holder capacity when regarded as a reserve, it increases the need for it as a mixing chamber.

The only practical objection to the gasholder is that it cannot be used for high pressures. The principles involved in its structure are such that it is limited to about 12 inches head of water. Within this limit, it is perfect in operation. Occasionally an æsthetic howl is raised as to the ugliness of the structure; but there is nothing serious in this, as the average Briton would not agree to even a trifling increase in the cost of gas for the purpose of beautifying holders or of doing away with such blots on the landscape. Indeed, we may question whether his objection to shams in any form would not lead him to prefer, apart from any question of question of cost, that the holder should stand exposed in honest ugliness, rather than be concealed inside a dummy castle, opera house, or heathen temple. The real difficulty with the holder is the financial one. The interest on capital and cost of maintenance of a twenty-four hours' storage capacity means a charge of not less than 3d. per 1,000 cubic feet of gas sold; and this charge has no relation to quality. The cost of storage for a million cubic feet is the same, whether we have the cheapest producer gas, two-thirds of which may consist of nitrogen and carbonic acid, or a rich 100-candle oil gas. With the latter, the cost of storage is an inconsiderable proportion; but the case is different when dealing with cheap fuel gas. If the selling price is 1s. 3d. per 1,000 cubic feet, the cost of storage bulks as 20 per cent. of the whole. In such circumstances, the cost of storage may be greater than that of the staple material, and under ordinary conditions of gas manufacture it may approach the net cost of the coal; so that even a moderate reduction in the storage capacity would be a boon not to be despised.

At one time the gasholder was regarded as a reserve in case of accident resulting in the make of gas being stopped for some hours. But gas-generating apparatus is now so fully understood that it is not necessary to stop gas making in order to investigate and find out what is the matter; and if reasonable care is taken to keep all in order, we may run along comfortably from one year's end to another without having to slack out even a single retort. The consumption of gas is also more even over the twenty-four hours; and therefore the reserve held in stock need not be so large as was prudent at an earlier stage of our history, when gas making was not so well understood, and when the load-factor diagram (had such a thing been thought of at that time) would have been more remarkable in the matter of peaks than it is under modern conditions, and would have some resemblance to that obtained at an electricity supply works. Taking the summers of fifty years ago, there was no gas consumption worth mentioning between midnight and 8 P.M. the following evening; and the variation between maximum and minimum stock of gas during the twenty-four hours was as much as 80 per cent. of the output. But now, in a town doing a fair cooking and engine business—which means about one cooker to every 2 or 2½ consumers, and one engine to every 40—the demand for gas during the breakfast and dinner hours usual in the district will come close up to the highest evening consumption, and engines and other appliances will be drawing on the mains all day; causing the difference between the maximum and minimum stocks in the twenty-four hours to be not more than 20 per cent. The greatest difficulty in the way of variation of demand arises during the winter, when it follows closely on variations in the thermometer. A sudden frost, following comparatively mild weather, may send up the consumption 20 per cent.; but a reasonable reserve of water gas plant will take care of this little matter. While, however, a large reserve stock of gas is not so imperative as formerly, a reasonable proportion of gasholder capacity is an indispensable adjunct to the retort or cupola as usually worked.

At this point, I would like to pause for a moment in order to re-echo the lament uttered by Mr. George Tangye (*ante*, p. 217), that the article usually spoken of "coal gas" is without any more definite name. A writer dealing with the science or practice of gas supply, is to a large extent dependent upon unwieldy generalisms, such a "coal gas," "carburetted water gas," "generator gas," and so on, and is much in the same position as a brewer or an iron founder would be, if confined to such terms as "fluid" and "metal." Perhaps it is too late in the day to suggest that the term "Murdoch gas" should be applied to ordinary or straight coal gas. But however opinions may differ on this point, there is no disputing the fact that the retort process still retains the main features introduced by the inventor, and that Murdoch's claim is more clear and decided than that of the originator of any other personally-named gas. When new gaseous products from coal to which this method of nomenclature has been applied, the article supplied by statutory gas companies is frequently at a disadvantage for want of a smart definite title. Shakespeare's hackneyed quotation does not apply to modern busness conditions, in which great importance is attached to a name—not so necessarily of a suitable, as of a striking and suggestive character. Indeed, this is carried to extremes, as by the use of such ungrammatical abominations as "yusabit," or "ryteesi." Without, however, going to the ridiculous, it might be possible to arrive at short distinctive titles for retort coal gas and for generator, water, or oil gas.

There are two methods of distributing gas which dispense with gasholders. In the system of distributing at high pressures, as practiced in the natural gas territory in the United States, and to a slight extent elsewhere, the use of the holder is obviously impracticable.

One feature of the Mond gas scheme, too, about which so much has been heard lately, is the use of an adjustable and continuous acting generator, whereby the make of gas is caused to synchronize with the demand. The exhauster or blower at the inlet of the generator, is controlled according to the pressure on the supply mains. Under the usual conditions of gas supply, with an unchecked distributing pressure not more than an inch or two in excess of that actually required for combustion, the storage capacity of the mains is not worth consideration. A complete failure throughout the district is a question of a very few minutes, after stopping the supply at the outlet from the works. But when, as is the case with natural gas, the distribution pressure is anything between 20 and 100 lbs. per square inch in excess of that actually required (the excess being reduced by means of a special appliance on each service), very different conditions prevail. The content of a mile run of 10-inch pipe may be anything between 2,500 and 15,000 cubic feet, when measured at atmospheric pressure; and, given a fairly constant source, it is quite possible, by keeping an ample reserve or excess of pressure, to give the consumer a uniform supply, without other assistance in the matter of storage. This advantage, incidental to high pressure distribution, has not failed to attract the attention of manufacturers of artificial gas, and may be expected to command increased consideration in future. For many reasons a pressure of from 10 to 15 inches would be more satisfactory than one of 20-tenths. The higher pressure gives better results with the Welsbach burner, which simply means that the atmospheric burner is more efficient because a more intimate mixture of gas and air is obtained—an advantage applying to all burners of that type.

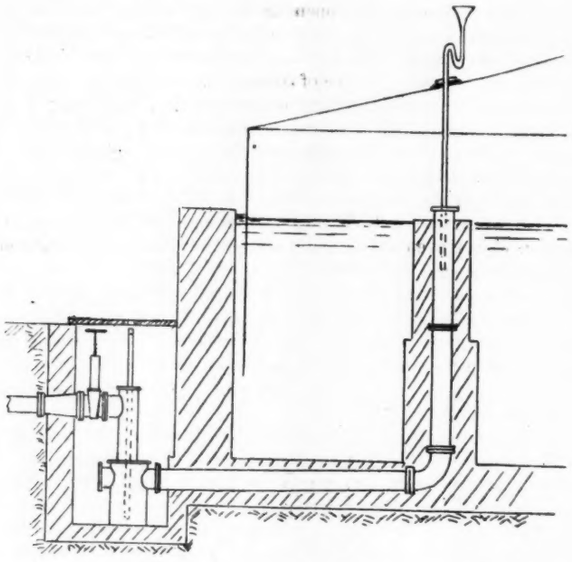
The method by which the Mond Gas Company propose to steer clear of the ordinary distribution difficulties includes several novel points, which lead one to look with interest for the actual practical results, in connection with a number of consumers. It has for some time been in operation on the Mond works at Winnington; but supplying one's own requirements is a very different thing to guaranteeing to satisfy those over the whole of a county. The generator is so contrived that it can be fed with fuel, or the ash and clinker can be removed, without stopping the blast and generation of gas. It is simply a question of adjusting the blast according to the pressure on the outlet-main from the works. This undoubtedly great advantage is, however, not obtained free of cost; and some of the conditions necessary are such as to render it inapplicable to the manufacture of a pure, good quality gas. The heat necessary for the gasification of the coal is supplied by the combus-

tion of a part of the charge, and brought about by air containing 80 per cent. of inert materials. The products of combustion and this inert matter must necessarily go forward, mix with the product, and be sold to consumers seeing that the removal of carbonic acid is costly, and that there is no known method of removing nitrogen. Dr. Mond is certainly entitled to the credit of the idea of selling chimney gases to the consumer at the current rate, whatever that may be, instead of allowing them to go to waste; and when one remembers the outcry raised in connection with coal gas from time to time, with respect to the air process and other matters that had led to the presence of perhaps 2 per cent. of diluent in the gas, it may be doubted whether the consumer will take kindly to the idea of paying for a 60 per cent. loading of carbonic acid and nitrogen.

Then Mond gas is in no sense a purified gas. The ammonia is absorbed by means of an acid solution – a process that has no effect in respect to the removal of other impurities, and therefore is not available to assist in the purification. The only purifying process besides the acid solution is washing with water. The whole of the volatile sulphur, including that usually taken up by liquor and tar, and also a considerable proportion of that which is retained by the coke, passes forward with the gas; and practically the whole of it is delivered to the consumer. Mond gas therefore, would not be pure enough to permit of being used in ordinary living rooms, as coal gas is. If any attempt was made to free it from sulphuretted hydrogen, as is done with coal gas, the variable rate of production would present practical difficulties; and a purification plant capable of dealing with the maximum production would be required. Taking the condensation alone – that is, the removal of all suspended matter—it is not easy to treat large and variable quantities of gas. But apart from these and other difficulties that may be expected to arise in practice, the continuous and adjustable generator is the only complete solution of the distribution problem; and, as such, it may be recommended to the careful study of all interested in the manufacture of gas at the present time.

Removing Naphthaline Obstructions from the Inlet and Outlet Pipes of Gasholders.

Under the above headlines Herr Director Wahl, of Guestrow, Germany, describes, in the *Journal fuer Gasbeleuchtung*, his experience and remedy for cases of the nature in point. An inspection of the accompanying illustration is virtually sufficient to show the aims and ends of the device without further explanation; but a word or more in reference thereto may not be amiss. Herr Wahl provides for the inser-



tion of a sealed pipe directly over the inlet and outlet mains, as shown. He then half fills the stand-pipe with water, adding after that from 2 to 4 gallons of a solvent mixture, which in his case was xylol, or anti-naphthaline. Then, the water would be slowly removed from the stand-pipe by pumping; and the solvent following the water would dissolve the obstruction. If (so Herr Wahl remarks) the solvent were to be introduced direct into the pipe it would only dissolve the obstruction in streaks, whereas the following of his plan insures a complete removal of all the naphthaline present in the pipe, which is finally pumped out in the form of a mushy mass. The translator has had more than one experience with stopped holder pipes, and to effect a remedy introduced a solvent exactly as described by Herr Wahl, and the solvent employed, while ranging from gasoline to kerosene, was always effective, almost immediately. The Wahl way is communicated to the readers of the JOURNAL, to some of whom it may be new, despite the "Wrinkle Departments of our Associations, in the hope that it may prove a "sure cure."—F. E.

Difficult Water Pipe Laying at Pittsburg.

A difficult piece of work, done by a local contractor, was the laying of a 42-inch influx pipe for the Pennsylvania Water Company, at Wildwood, on the Allegheny river. The entire task consisted of the sinking of two large cribs or filters and 480 feet of pipe which weighs 400 pounds to the foot. The cribs and piping had to be sunk at one time. The 2 cribs were each 5 feet 6 inches deep by 48 feet wide and 480 feet long, with 480 feet of 42-inch pipe connected to the cribs by 4 connections. This work was done above water and 1,000 feet of the same size pipe extending from the crib to the pump station was laid under water by divers.

John H. de Carpentier, a member of the contracting firm, took charge of the work, which began last March. The cribs were filled with different kinds of filtration apparatus and supported the connecting pipes. It took 75 men almost 5 months to complete them.

While the cribs were being completed two local divers were engaged and the work of laying the 1,000 feet of pipe under water was commenced. First, the huge excavation in the river bank at Wildwood was braced, then the connection for the pumps placed in position, after which the first length of pipe was placed in the hole. As each length of pipe was lowered to the bottom of the river by a crane a diver would go down with it, and after bracing it in position he would come to the surface for fresh air and his place would be taken by another diver, who would enter the water and caulk the joints. For this work lead and oakum were used. It took a long time to complete the laying of this underground tunnel, as a man was unable to stay under the water more than half an hour at a time and the work of caulking the pipe was very slow, as the heavy diving suits worn by the divers made it impossible to work rapidly.

Eighty-four lengths of pipe were used in this work, each length weighing 4,800 pounds, and on account of the enormous weight the handling of it above water was rather slow. By the time this pipe had been laid the cribbing had been completed and the work of laying the heavy pipe between these and connecting them to the cribs was commenced. To do this the cribs were fastened together a few feet apart and heavy trestle work built between them on which the pipe was hung by ropes. As each length was put in place it had to be caulked to the other before another could be hoisted. When the entire line of pipe had been completed and made ready for sinking, several barges of rough gravel and stone were landed alongside of each crib and men started to unload this on top of the cribs. Before this work was started, however, a man had to be stationed on each of the trestles to which the pipe was hanging, as the entire weight was by this time depending on the ropes and as the cribs sank these ropes had to be slacked off and the work once started had to be continued until the entire line lay on the bottom of the river. It took 2 days to sink the cribs and pipe. The entire work consumed about 6 months' time.

Everyday Dimensions for Plumbers.

The *Metal Worker* says that experienced workmen often have recourse to methods, outside of generally accepted practice, which are found useful and effective, and, therefore, are worth while recording. In many little details of work variations are made that are not sufficient to upset the standard, yet which demonstrate the license that a competent hand may take without wasting time or material or interfering with the quality of his work. Among these details are the dimensions of wiping cloths and those of the joint to be wiped. There may be those who do not observe the dimensions given below, but who will be willing to concede that they can be used with advantage until a workman finds what changes may be necessary for comfort and convenience.

Many plumbers do not risk their wiping cloths in the tool bag, but are apt to carry the favorites particularly, if not the whole set, in the

hip pocket. Although wiping cloths can now be bought at most of the supply houses, there are many workmen who still make their cloths of whatever material best suits their purpose, moleskin, bed ticking of good quality and other smooth finished cloths being used. The size varies according to the work to be done, but usually follows these dimensions:

Size of Wiping Cloths.

	Size of Pipe. Inches	Size of Material. Inches.	Size of Finished Cloth. Inches.
Round joints.	⅜ to 2	12 x 12	3 x 3
Round joints.	4	16 x 16	4 x 4
Branch joints	⅜ to 2	10½ x 10½	2½ x 2½
Flange joints	....	13 x 7	3¼ x 1¾

The cloth is folded with the two outside edges to the center, and then folded again, giving a long, narrow strip. Then the ends are folded to the center, and again folded, leaving no raw edges. The ends are now secured by sewing with secret stitches in one place on each side. This leaves the cloth pliable and ready to have any loose nap burned off against a hot solder pot. Finally they are rubbed with chalk to fill the pores and greased for use. Other sizes of cloths are doubtless used to suit the work or the convenience of the workman.

The space on the material to be shaved clean to wipe a joint is in many instances not measured, but is not far from what is given below:

Length of Joints.

	Size of Pipe. Inches	Clean Space. Inches.
Round joints	⅜ to 2	2
Round joints	4	1¾
Branch joints.....	...	1 x 1½
Flange joints	....	¾ x ¾
Tank seams	....	⅞ x ⅞

In cleaning space for branch joints, the longer space is cleaned along the pipe each side of the branch opening and the shorter space on the branch. On each side of the cleaned space the material is soiled, covered with paper or pasted, to suit the workman. In order to have their work look uniform, some men have oval forms of stiff paper, leather or other flexible material, which they lay on the pipe to mark out the space to be cleaned for making branch joints, but more use the dividers to mark the space, having one leg of the dividers on the inner edge of the branch opening and using the other to do the marking.

American Commercial Supremacy.

By Mr. Egbert P. Watson, in *Iron Age*.

The very heavy capitalizations of various industries in this country recently have attracted attention both at home and abroad, not only for their scope and large number, but also by the manifest intention of the operators to control certain lines of manufactures. It is natural that this should excite alarm, abroad especially, where vested interests are very large in the aggregate, and that serious consideration of the best means to retain trade should occupy the attention of foreign manufacturers. Technical and financial journals are discussing the subject from their standpoints, and it is proposed to send deputations of artizans, skilled in their several callings, to this country to examine into our methods in order that they may discover, if possible, how it is that we are able to turn out so much more work in a given time with a given plant than foreign manufacturers are able to; but it is evident to even a superficial observer that none of these measures will meet the emergency.

For many years last past American workshop systems have been fully discussed and illustrated in the columns of the *Iron Age*, not only those in general use, but valuable propositions as well, and the same is true of publications in other lines of trade. As for deputations, they began with the first Paris Exposition, and have descended upon our shores from all countries where manufactucing is carried on to any extent, without benefit to them or injury to us. Deputations are like prophets in one respect, without honor. They are the minority, and when they return the majority of their countrymen deny the possibility of the things that they allege they saw done, and go on in the old way. This is the natural order. It is not to be expected that 50 men can alter the practice of years by visiting other countries and telling what they saw there.

If the renaissance of foreign trade depends upon deputations, or even private commissioners, it will be a long time in maturing. In addition to the visiting craftsmen of other countries, their own manufacturers have come here, and not only inspected our systems thoroughly, but have purchased complete outfits of American tools, which they installed in their own shops, and were then unable to turn out the same amount of work of the same quality in a given time.

If these assertions are correct, then it is apparent that Europeans generally do not comprehend the whole situation, or at all realize that the question is far more complicated in all its aspects than they imagine it to be.

It is not a proposition which is based upon tools, plants, systems, or even natural resources and untiring energy. The way of living is also connected with it, and it is this which delays, perhaps baffles is a better word, a satisfactory solution of the problem. It is not merely industrial, but politico-social as well. The liberty of the subject is a factor in the equation; with it omitted there can be no serious opposition to American progress everywhere.

The conditions of "life, liberty and the pursuit of happiness" are so vastly different in Europe and America that they cannot be ignored when commercial supremacy is discussed. No ways and means, retaliatory tariffs, or adoption of American tools will be of any avail. The balance of trade will always be in our favor so long as we maintain the integrity of our institutions. I have said that the ways of living are different abroad. To illustrate my meaning, suppose an American works transported bodily to England (as a country where practically the same language is spoken) in a night, the men leaving off work in this country and beginning again the next morning in England under English shop rules and working hours. How would the output compare with the day previous in America? I am free to assert that it would be much less, not merely from the unfamiliarity with English ways, but from the brake that would be put on by English methods.

The working hours are cut into segments, and the speed of production regulated by that of the slowest mule in the team; if Hodge can turn only so many feet of shafting per hour, no other man must turn any more.

That restriction would of itself throw everything out of gear so far as an American workman was concerned. Another one is that English shops commence work at 6 A.M., stopping at 8 for breakfast, beginning again at 9. That is to say, at the very time—the early hours—when the men are at their best, most alert and capable, they cease work. The machine tools stop. That is a condition of things which would not be tolerated one moment in an American shop; but it is the custom, and therefore sacred in England. There is no reason whatever for the loss to the firm, because, although the same number of hours nominally may be worked weekly, there is loss by reason of the interval transpiring between stopping and starting in full work again. There is at least 5 minutes lost on each machine tool, and much more than this with fitters and erectors, who have an inordinate amount of gossip to exchange upon what shreds and patches of happenings they may have picked up during the breakfast hour. A workshop is not a penal institution, and it is impossible for an overseer to be behind every man to find out what he is talking about. Suppose a force of 300 men only, and 100 machine tools; under the conditions named the unproductive time would be 33 hours per working day, or nearly 20 working days in the whole week. This is a long price to pay for the interruption of the working hours, and must be directly charged to that custom. Were it not for it the men would keep on working and their attention would be confined to their jobs instead of being diverted from them. When the machine tools stop in an American works, even to lace the main belt, which may have parted, it is regarded as a serious matter.

Most foreign observers admit that American shops turn out more work per capita than their own, and they try to account for it by the assertion that our men are driven as a collie drives sheep. We certainly work harder, but we are compelled to by the foremen, who occupy much the same position that the keeper in a State prison does, sitting upon a high stool where he can see all that goes on and admonishing laggards severely. It is hardly necessary to say that this is an erroneous conception; there is no coercion or intimidation of any sort in American shops, but the work proceeds because the foremen and others over him plan the series of operations before it is undertaken. Quite the contrary obtains in England, where, if a "Consulting Engineer" writing in *Engineering* is correct, the men take what they like to do the best upon any given machine, work a little while upon it, get tired of it, then throw it aside for something else. The writer mentioned says that he found he could not make any money by this way of working, and therefore abandoned it for American methods pure and simple, since which time he has gone ahead rapidly.

It is not only in the shop that delays are encountered, but in the counting room as well. It is of little use to adopt better systems in foreign workshops if the ancient and honorable practices that have been

handed down from time out of mind are still kept in force. To abandon these, however, would shake the very foundations of precedent, the worship of which goes on ceaselessly. Certain things cannot be done because they never have been done; certain other things must be done because they have always been done. Selah! Now the via precedent is a long road, and tiresome withal, so in this country we simply cut across lots and get to the terminus quicker. We do not care what man has done in the past, but are more concerned with what he is going to do now, and how soon.

Furthermore, when an American has business with an American firm, he goes to their place, finds out who has charge of the line he is interested in, and transacts his business there and then; but if he goes to England and attempts the same course, he will find that he has much to learn. "Other lands, other customs," and no summary proceedings are tolerated. Foreign business houses require that visiting foreigners shall be duly accredited before they even get a hearing; as for having persons walking in upon them, wearing unorthodox hats and coats, flourishing cards and demanding prices and terms on the spot, such practices are subversive and cannot be permitted. They must be identified through regular channels before they will be recognized as having any rights whatever.

If by force of arms or strategy an enterprising American should force his way into the office of a foreign general manager, his reception would be like unto that of Patroclus's when he interviewed Thersites ("Troilus and Cressida," Act III.), to wit:

Patroclus—"I come from the worthy Achilles."
Thersites—"Ha!"
Pratroclus—"Who most humbly desires you to invite Hector to his tent."
Thersites—"Hum!"
Patroclus—"And to procnre safe conduct from Agamemnon."
Thersites—"Agamemnon!"
Patroclus—"Ay, my lord"
Thersites—"Ha!"

It must be admitted that this line of conversation is calculated to depress visiting Americans (perhaps it is the intention of it), but it just as surely defeats the object of keeping an office open, which is supposed to be for the convenience of persons having business with a firm, not to interpose obstacles to it. Here we listen to all comers first, regardless of their ancestry, and find out subsequently whether we want further relations, which seems to be commendable upon the score of courtesy at least. It takes too much time to do business by the methods cited, and time means money the world over.

Thus far I have arranged certain business methods pure and simple, but have asserted in previous lines that American supremacy, as shown by our recent commercial development, is both political and social, by which I mean the relative advantage enjoyed by citizens of this country as compared with other countries under different auspices. That these are factors cannot be denied, and very important ones in the struggle for first place.

It makes no difference in this country what a man's business is, provided that it is lawful, his social status is assured, and all his rights under it are protected. The humblest citizen can summon the greatest citizen for overt acts with the certainty of protection if his cause is just. Is this the case in foreign countries? Is there not such a thing as class legislation there, and are there not some hereditary rights and privileges accruing to persons of rank which commoners cannot command?

Do not class restrictions as effectually hamper men from realizing all their ambitions, as caste in India prevents universal intercourse? In foreign countries a certain nominal freedom of speech and a pseudo share in the government is conceded in certain branches of it, but the actual administration is based upon what some hereditary power thinks is best for the people, by no means what the people think would be best themselves. Abroad a certain number of law makers say what the people shall have, but here 14,000,000 of voting law makers say what they are going to have, and they have it. The effect of American institutions, manners and customs wholly changes those of foreigners in a very short time after their arrival here. Some years ago labor was so scarce in the coal regions that the operators were forced to import large numbers of Hungarian miners. When they reached here and had set up their domiciles, a hue and cry went forth at once on account of their habits. In the city of Scranton they were segregated, and not allowed outside of certain limits; but in a very short time, a few years only, the force of example, aided by some salutary ordinances, convinced the fiery Huns that the American way was the best, and I am assured by those who know that the descendants of the once despised Hungarians are among the most desirable citizens. The same is true of emigrants from all other countries who seek asylum among us; so soon as they are able to comprehend our laws and institutions, and learn that liberty is not license, they adopt American ways and become part and parcel of the Republic.

I have said previously that foreigners do not seem to comprehend this aspect of the question of commercial supremacy, and I have formed this opinion from reading the published views and speeches of their essayists and officials upon what they term "the American invasion," meaning our occupation of foreign markets wherever we can do so with profit. In none of the utterances can I find other than the most optimistic views. They profess to feel that the strength of our position lies in financial combinations of great magnitude, and consider that the best way to bring our schemes to naught will be to form syndicates of their own, with still larger capital, to exploit certain threatened branches of trade. They point to what they have done in the past, forgetting that the conditions were vastly different. Any people can be enterprising when they have no competition. Foreigners concede that in our microcosm we have done things which have commanded admiration, and they intend to discount any advantages we possess in great energy and unlimited resources by waking up a little, as one of their essayists says, and resolving to do better in the future. In all this there is a note of despair, and in this connection despair means that they feel that they have no defense which can be opposed to the conditions which exist without another form of government.

I confess that I do not know how this change could be brought about, and therefore do not attempt to tell; but I feel quite certain that, given a government whose base rests upon freedom of speech, thought, action, liberty of the person, unchecked by bayonets in the foreground or in the background, there is nothing that can prevent it from reaching to the uttermost parts of the earth, outstripping other peoples without similar advantages. Men who are without a stake in the future of their country (beyond a sentimental one) are emasculated, in comparison with the virility of those whose ventures comprise "their lives, their fortunes and their sacred honors." That is practically the nature of the ventures represented by American commerce, for the men in it are, compared with other nations, a distinct race with its own methods of accomplishing certain ends. Unhampered by routine rule, unfettered by paralyzing precedents, they will possess the earth, because their base is assured.

This United States is a flexible, automatic autonomy, adapting itself to all conditions which may arise, meeting every exigency with serene confidence in its ability to overcome it by common sense legislation. Even if that shield and buckler of the State, the Supreme Court, should be abrogated, the people would still remain, and they are truly the court of last resort. They move slowly sometimes, but when they do move they accomplish their purposes.

Drafting.

Engineering Record editerially remarks: It is generally believed by engineers, mechanical and civil, that the purpose of an engineering drawing is to depict certain objects or relations more clearly than can be done by words. This being the case, why is it that so many drawings are prepared in a manner confusing to the user of them? In many public and private offices the work is excellent, it is true. But we still have the bed-spread sheets which have to be consulted in the far corners with the assistance of a transit instrument, and as a contrast there is the sheet of note paper with lines in carpenter's crayon and lettering done with worn-out pencil stubs. Between these not infrequent monstrosities are sheets of reasonable size where everything must be laboriously scaled if dimensions are wanted and those things on which there has been an expenditure of an hour in drawing and 10 hours in lettering and gingerbread work which it is a murder of the English language to call ornamentation. The technical schools have accomplished praiseworthy results in late years in raising the standard of drafting, but it occasionally seems as though their work and teaching were counterbalanced by the carelessness of men who should insist on good workmanship in the drafting room just as strongly as in the shop or the field. In drafting as in other skilled work, the responsibility for the quality of the product rests with the employer, who alone is the judge of what he shall turn out.

It is not enough in these times of keen competition among engineers to have a store of theoretical and practical information at instant command; it is necessary to put that information in shape to be understood

by the employer or his agent with as little study on his part as the subject permits. No business man likes to have his desk cumbered with yards of blue prints where small sheets are equally good, and no workman likes big drawings if he can have equally clear little ones. The engineer draws his fees or his salary for making his particular class of specialized information clear to those who have not acquired it by study and experience. If he does not make these subjects clear, provided his own knowledge is not so muddy as to be incapable of classification, he is taking money which he has not earned.

A satisfactory drawing must fulfill two classes of requirements; it must answer all reasonable inquiries made of it by the user, and it must be produced economically and kept readily. The reasonable use of a drawing is not often borne in mind during the drafting, and valuable time is wasted every working day in the year in producing tracings of an accuracy as ridiculous in view of their purpose as the use of decimals in expressing the result of the test of a 1,000-horse power steam plant. The same lack of regard for the user of a working drawing leads to the omission of figuring of dimensions; no draftsman has any right to steal another man's time by such neglect, particularly when he knows, if he knows anything about the craft, that the shrinkage and stretching of drawings render scaling hazardous. Another mark of shiftlessness is careless lettering. Lithographers' Gothic, upright and inclined, can be executed with great rapidity and satisfactory results after a little steady practice, and block letters for main titles, although more difficult to make, can be drawn quickly by anyone who is willing to take the trouble to train his hand and eye. Fancy letters and alleged scroll work are generally as out of place on an engineer's drawings as elaborate shading and conventional hatching for little used materials.

The requirements of economy in the drafting room render it desirable to make drawings on sheets of a few standard sizes. Formerly the sizes were very large, but there has been a commendable reduction of these dimensions of late. The value of an engineering design is not proportional to the area of paper on which it is depicted, and a number of engineers who have waked up to this fact are already using sheets of very small size. Everything is indicated in outline in the drawings of assembled parts, figuring being used to give the sizes of all parts, with detail sketches on a larger scale of the portions of the general diagrams requiring further explanation. The simplicity, clearness and handiness of these drawings are in striking contrast to the old-fashioned deserts of paper. Of course, all drawings cannot be made in this manner, but most of the present output can be rendered much simpler and clearer. Usually there are one or two small parts of the machine or structure which are far more complicated than the others, and these are generally allowed to set the size for the entire drawing, making a sheet perhaps 36 inches long. By the up-to-date plan the size of the sheet is fixed by the general outline, and these special features are drawn on a larger scale, generally on the same sheet. This cuts the size of the sheet in two, renders it unnecessary to wear out one's eyesight in reading large drawings, and makes the whole presentation of the subject concise and compact.

The busiest part of the drafting year is now approaching, which is the reason for calling attention at this time to these features of such work. No employer cares to spend money on drafting which is neither economical in first cost nor of the best service when completed. It is an easy matter to give these suggestions a trial, just as it is not difficult to arouse enough interest in their work among men to have them acquire facility in neat, rapid lettering. It may not be worth the bother in some places, perhaps, but, judging from an acquaintance with the drafting output in all parts of the country, there are opportunities for improvement in many offices, large as well as small.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THROUGH the courtesy of M. Piaton, President of the French Association of Gas Managers, we are informed that the headquarters of the Association have been removed to 105 rue Saint Lazare, Paris.

MR. W. R. FABEN has been appointed Manager of the Owosso (Mich.) Electric Light and Street Railway Company.

MR. WILLIAM D. MARSHALL, formerly connected with the St. Paul (Minn.) Gas Light Company, has been appointed Superintendent of Manufacture of the New Orleans Light Company, vice Mr. Frank Carroll, resigned. Mr. Marshall was for a number of years associated with Mr. Bankson Taylor, Manager of the New Orleans Lighting Company, with the St. Paul Company.

MR. HENRY ROCHAT, formerly in the service of the St. Paul Company, and later on, Superintendent of the Ashland (Wis.) Gas Light Company, has been appointed to an important position in the New Orleans Lighting Company.

THE capital stock of the Peoples Gas, Electric and Heating Company, of Bloomington, Ind., has been increased to $150,000.

MR. MASTIN SIMPSON, formerly Superintendent of Distribution, Newark district of the Essex and Hudson Gas Company, of Newark, N. J., has accepted a responsible position with Messrs. H. P. Wright & Co., bond and stock brokers, of Kansas City, Mo.

THE Binghampton (N. Y.) Gas Company, has been absorbed by the American Light and Traction Company, which latter concern is to be the undertaker for several of the McMillin syndicate gas and electric lighting properties.

THE people of Two Rivers, Wis., are seemingly anxious for a gas supply. It is likely that the proprietors of the gas plant at Manitowoc will extend their main system to Two Rivers.

THE Los Angeles (Cal.) Lighting Company announces that on and after January 1, 1902, the net selling rate will be reduced to $1 per 1,000 cubic feet. The Company requires no meter deposits, and offers to make connections free of charge and to sell all appliances at cost.

THE gas and steam heating plants of the Bellefonte (Pa.) Gas Company, which have been under the direction of a Receiver for something over a year, were sold at sheriff's sale August 30th. Mr. Henry Brockerhoff, acting for the bondholders, bought the property for $51,000. The bonded indebtedness amounted to $50,000, and the debts to $7,500 more. Of the latter, two-thirds stands for past due interest. The gas plant is to be rebuilt.

COL. J. W. R. CLINE, formerly Manager of the Covington (Ky.) Gas Light Company, has purchased the plant and properties of the Gas Company of Paris, Ky. We understand the Colonel will operate the same on personal account. The plant will be thoroughly overhauled, and the contract system of selling gas, which largely prevails in the Paris Company's method of doing business, will be abrogated.

THE Cohoes (N. Y.) Gas Light Company has appealed to the Supreme Court for relief from the action of the State Tax Commission in fixing the value of its franchise at the evidently inequitable figure of $73,000. Argument over the appeal will be made October 26th.

MESSRS. C. R. COLLINS and J. W. Clise have petitioned the authorities of Ballard, Wash., for the right to construct and operate a gas works. Ballard at present is operating an electric lighting plant on municipal account.

A CORRESPONDENT in Toledo incloses the following under date of August 31st: "Commenting on Toledo's experience with its city gas (natural) plant, the Pittsburg *Dispatch* says: 'The Toledo municipal gas plant has been rented to a private corporation after it has sunk $1,000,000 of the taxpayers' money. That is not the end of the expense, either. Interest and sinking fund will, for several years, exceed the rental by some thousands of dollars. The experiment has been a costly but instructive failure for the pretty, progressive city on the Maumee river. The municipal natural gas enterprise did not even have the effect of keeping down rates. The Northwestern Ohio Natural Gas Company never found the competition of the city plant sufficient to induce a lowering of rates, or even to prevent an advance when it was found necessary. Toledo has paid the same rate of 25 cents per 1,000 cubic feet that has prevailed in Pittsburg during the same years. The Toledo experiment in municipal ownership of fuel gas was confronted by nearly all the usual difficulties of political management. There were no charges of corruption, but there was an amount of inexperience and incompetence sufficient to handicap the project. While the private company had a perfect plant of inter-communicating pipes, the city had one but indifferently planned. In the field the private corporation was ready to take advantage of every circumstance, while the city gas trustees were compelled to go through legal formulæ before they could act. The original estimates of cost were too low and additional funds had to be obtained by delayed bond issues. It is quite safe to venture the prediction that Toledo will not soon try another experiment in municipal

ownership. It has a Golden Rule, non-partisan mayor and a large stock of socialistic sentiment, but it has experience that is more valuable. Its experience ought also to be worth something to other municipalities which may feel tempted to launch in speculative enterprise in competition with capably managed private corporations.'"

"A TRAVELING MAN," writing to the JOURNAL from Columbus, Ga., under date of the 2nd inst., says: "The Gas Light Company of Columbus has commenced work on an important extension of its main system to the northern and northeastern suburbs of the city. For some time the work of laying a main up Hamilton avenue to Rose Hill has been in progress. The work had been completed as far as 23rd street, when a halt had to be made on account of the lack of material. The Company ordered a large lot of pipe from a Chattanooga concern early in May, but the press of work on the foundry was so great that the goods were not received until the last week in August. The work of laying the pipes out of Rose Hill and to East Highlands when completed will really mean that another town will have been put on the Company's system. The extension means a good round expenditure, but in urging the necessity of doing the work Superintendent Ferrier argued that the new business that could be thus acquired, in the instance of the use of gas for fuel alone, was sufficient warrant for the proposed action."

THE betterments on the plant of the Modesto (Cal.) Gas Company have been completed.

THE following is from a recent issue of the *Staten Islander:* "A great benefit to Staten Island occurred when the old Richmond County Gas Light Company changed hands, and the new Company, known as the New York and Richmond Gas Company, was formed. The managers of the new Company are men of keen foresight and great business sagacity, as is demonstrated by the manner in which they are conducting the affairs of the new Company. The present management of the Company is liberal to a degree, and that is where Staten Islanders are being benefited. The first important step made by the new owners on taking control was to reduce the price of gas from $1.50 per 1,000 cubic feet to $1.25. The managers argued that the consumption of gas at a reduced rate would be greater than at $1.50 and believed that it would be only a short time when profits would be greater as a result. That their reasoning was good is shown by the many new customers who are daily having their houses piped for gas—which, by the way, is another new departure. The new Company will pipe your house at the very small cost of $1.75 per room, and will sell gas fixtures and Welsbach lights at cost and set them up free. The gas stove department, which was practically an unknown quantity in the hands of the old Company, has under the almost magic touch of the new concern in the way of hustle and judicious advertising become one of the most important branches of the business. A big gas range for $10 has appealed to common sense people, and many ranges have been sold during the summer and have given universal satisfaction to those who have thus far purchased them. The gas range does away with the dust so common and necessary with a stove or range. There is no kindling of a fire and waiting a half hour for it to burn up. The gas range is instantaneous and clean, and for that reason has endeared itself to the good housekeeper and cook. With the reduced price of gas the ranges can be operated at less cost than a fire, and that is another reason for its popularity."

SUPT. H. W. BENNER, of the Wyandotte Gas Company, has under way the remodeling of a building formerly occupied as a storage house by the Garfield Oil Company, on Lehigh avenue, below the Central Station, West Bethlehem, Pa., wherein he proposes to install a water gas plant up to an output of 600,000 cubic feet per day.

THE active management of the Adrian (Mich.) Gas Company, the properties of which were purchased some time ago by a Detroit syndicate, headed by Mr. Ernest F. Lloyd, of Fort Wayne, Ind., is as appended: President and Treasurer, Ernest F. Lloyd; Secretary, Alfred G. Lloyd; Manager, S. Milo Dole.

AT a recent meeting of the Finance Committee of the Spokane City Council, the provisions of an ordinance granting an extension of corporate life to the Spokane Falls Gas Light Company for a period of 25 years were submitted. Under its chapters the Company may charge not to exceed the following rates: For a monthly consumption of less than 1,000 cubic feet, $2.50 per 1,000; 1,100 to 3,000 cubic feet, $2.25 per 1,000; over 3,000 cubic feet, $2. The "revenue return" to be paid to the city was thus adjusted: For the first 5 years, $250 per year; second 5, $350 per year; third 5, $500 per year; fourth 5, $750 per year; fifth 5, $1,000 per year.

SEVERAL citizens of Los Angeles, Cal., recently filed a protest against the application of Messrs. Abbott Kinney and others for permission to erect a "complete modern gas works" on 16th street, east of Naomi street. The petitioners for the right are backing the proposed opposition gas works for Los Angeles, the corporate name of which is the Equitable Gas and Electric Company. The residents objected to the construction of the gas works on the site proposed on the ground that such a plant "would greatly depreciate the value of their property, which is now quite valuable for residential purposes."

THE Board of Gas and Electric Light Commissioners for Massachusetts will give a hearing on the 10th inst. to the authorities of Worcester, over their petition for a reduction in the price charged by the Worcester Electric Light Company for arc and incandescent electric lights supplied on public account.

MR. WM. B. RIDGELY, of Springfield, Ills., is likely to be appointed Comptroller of the Currency, vice Mr. Charles G. Dawes. Both of them are well known in connection with the gas business of Illinois.

IN a paper read by Mr. Morris W. Mead, Superintendent of the Bureau of Electricity, Pittsburg, Pa., at the Indianapolis meeting of the International Association of Fire Chiefs, on "The Danger of Electric Light and Trolley Wires to Firemen when Fighting Fires," the author said:

"In running overhead high potential wires in the business portion of most cities, there is too much carelessness in the arrangement of the circuits. I believe all electric light circuits should be run in parallel, and at regular intervals lead off to switches, and that such locations should be numbered and blue prints of every switch and of the location of every circuit should be prepared and kept on file at the headquarters of the fire department. These should all be carefully studied and gone over either with an expert of the local company, or with a competent city electrician. The firemen should be trained and instructed in handling the switches, as well as in general electrical principles, so as to understand the easiest and safest manner of handling them in case of emergency.

"Every circuit should be labeled at regular intervals with the voltage it carries, and all controlling devices should be made to correspond. Trolley wires can be arranged on the same principle, so as to be able to cut them out at every 1,000 or 2,000 feet in crowded cities, and these places can be carefully marked and records placed on file at department headquarters. In the larger cities, one or two electricians should be attached to the fire department and go to all fires, to assist and to instruct the members of the department in self-protection from high potential currents.

"One of the best remedies for danger from overhead wires is for cities to compel all wires to be placed underground in the business portions of the city and on all main avenues. Electric light companies in all cities can afford to do this, but all cities are not so situated as to make successful the underground trolley system. While New York city and Washington might successfully do this, yet I would doubt its feasibility in Pittsburg, or in any city where there are so many hills or where rivers sometimes flood the lower streets.

"In all cities, however, trolley feed wires can be placed underground and feed outlets arranged at stated intervals, thus doing away with much of the obstruction and some of the danger.

"The next step towards doing away with electrical dangers should be a complete city control over these matters; ordinances should be passed placing supervision of overhead wires in the hands of a competent city electrician, or, as above suggested, compel underground construction.

"Another safety arrangement which naturally suggests itself in the protection of firemen, in fighting fires, from electricity, is that all electric light and power companies, railroads included, should have thoroughly equipped wagons, located at reasonable intervals along their lines, with competent men in charge, to respond in every case of fire. This, I should think, would be a good thing for the companies themselves from the standpoint of economy, to say nothing about the protection it would afford to the firemen. Gongs connected with the fire department lines should be in all such headquarters, and if necessary there should be 2 crews attached, to relieve each other, or else to sleep there regularly as firemen do and answer day and night. Another convenient preventative is to have on hand rubber boots and rubber gloves, to be furnished to the firemen with insulated pliers, with which they can cut wires in case of necessity."

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

MONDAY, SEPTEMBER 9, 1901.

The Market for Gas Securities.

The tendency this week in the local gas share market was toward lower prices, the net loss in Consolidated since time of last writing having been about 2 points. It sold well below 225 today (Friday) and closed at 225¾ to 226. There is nothing of moment to report in connection with the situation, the standing of which is controlled by three men, who are working in perfect harmony, and who evidently are not disposed to act hastily. It is thought that too many shares of Standard, common and preferred, are outstanding to suit the views of the trinity; but as quite a block of the outside common is in pretty strong hands, the stock may in the near future be worth quite a bit more than the present bid for it. Meanwhile Chief Bradley and his engineering staff are getting ready for the tremendous demands that will be made upon the works for gas this late fall and winter. Many changes have been made on the plants since last April, and some of them taxed the ingenuity of the engineering force to the full; but the changes were satisfactorily made.

Brooklyn Union shows no particular difference from a week ago, but we think and believe that a demand for 1,000 shares of it for cash would put it to 230. Peoples, of Chicago, is at 111½ to 112. The capital of the Company is to be increased to $35,000,000. Washington (D. C.) gas has crossed the 300 mark, and the Philadelphia contingent must be smiling inwardly over the way in which they defeated that sortie on Washington gas of about 2 years ago. Good gas bonds (and they are many) continue in demand at advancing prices.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

SEPTEMBER 9.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	225¾	226
Central Union, Bonds, 5's.	3,000,000	1,000	109	110
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	118	120
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	305	315
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	.
New Amsterdam Gas Co. .. Bonds, 5's	11,000,000	1,000	107½	108
Northern Union, Bonds, 5's.	1,250,000	1,000	106	108
New York and East River.. Bonds 1st 5's	3,500,000	1,000	111	115
" 1st Con. 5's	1,500,000	..	109	111
Richmond Co., S. I.	348,650	50	100	..
" Bonds	100,000	1,000	103	..
Standard	5,000,000	100	135	..
Preferred	5,000,000	100	138	..
Bonds, 1st Mortgage, 5's	1,500,000	1,000	118	..
Yonkers	299,650	500	120	
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	215	217
" " Bonds (5's)	15 000,000	1,000	118	119
Bay State	50,000,000	50	..	1
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works...	450,000	100	30	40
" 1st Mtg. 5's	500,000	1,000	92½	95
Boston United Gas Co.— 1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	6	8
" " Bonds, 5's	5,250,000	1,000	69	72
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Central San Francisco	2,000,000	..	106	108
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas & Elec. Co.	29,500,000	100	104⅛	104¾
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	106	107
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	60	65
Preferred	3,026,500	100	84	86
Consumers, Jersey City Bonds	600,000	1,000	102	103
Consumers, Toronto	1,700,000	50	215	216
Consolidated, Baltimore	11,000,000	100	64⅛	65
Mortgage, 6's	3,500,000	..	..	118
Chesapeake, 1st 6's.	1,000,000	..	..	..
Equitable, 1st 6's.	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	12	14
" Con. Mtg. 5's	380,000	1,000	81½	83
Consolidated G. & E. Co.'s., Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co.	4,825,500	50		89
" Prior Lien 5's	5,608,000	1,000	99⅛	100
Detroit Gas Co., 5's	381,000	1,000	89	80⅛
" Inc. 5's	16,000	100	94	94½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	34	38
Fort Wayne	2,000,000	..	..	.
" Bonds	2,000,000	..	54	58
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	102	104
Hartford	750,000	25	240	250
Hudson County Gas Co., of New Jersey	10,500,000	..	25	..
" Bonds, 5's	10,500,000	..	101	103
Indianapolis	2,000,000	..	50	60
" Bonds, 6's	2 650,000	..	99¼	101
Jackson Gas Co	250,000	50	65	70
" 1st Mtg. 5's	290,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	90	95
Preferred	2,500,000	100	101	102
Bonds	10,000,000	1,000	..	108½
Lafayette Gas Co., Ind.	1,000,000	100		60
Bonds	1,000,000	1,000	48	55
Louisville	2,570,000	50	110	120
Madison Gas & Elec. Co. " 1st Mtg. 6's	350,000	1,000	102½	108
" 6 per cent. scrip, due 1910	100,000	25	87	89
Montreal, Canada	2,000,000	100	182	184¾
Newark, N. J., Con. Gas Co	6,000,000	..	..	55
Bonds, 6's	4,600,000	..	..	103
New Haven	1,000,000	25	290	325
Nashville Gas Lt. Co.	1,000,000	0	110	..
Oakland, Cal.	2,000,000	..	46	47
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	111¼	112
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	
Rochester Gas & Elec. Co..	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87⅛	90
San Francisco, Cal.	10,000,000	100	46	46½
St. Paul Gas Light Co.	1,500,000	100	60	63
1st Mortgage 6's	650,000	1,000	82	85
Extension, 6's	600,000	1,000	..	..
General Mortgage, 5's	2,465,000	1,000	88	90½
St. Joseph Gas Co. " 1st Mtg. 5's	751,000	1,000	93	96
Syracuse, N. Y.	1,750,000	100	17	19
Bonds	1,612 000	1,000	91	93
Washington, D. C	2,600,000	20	303¼	307½
First mortgage 6's	600,000	..	..	..
Western, Milwaukee. Bonds, 5's	4,000,000	..	106	108
Wilmington, Del.	600,000	50	210	215

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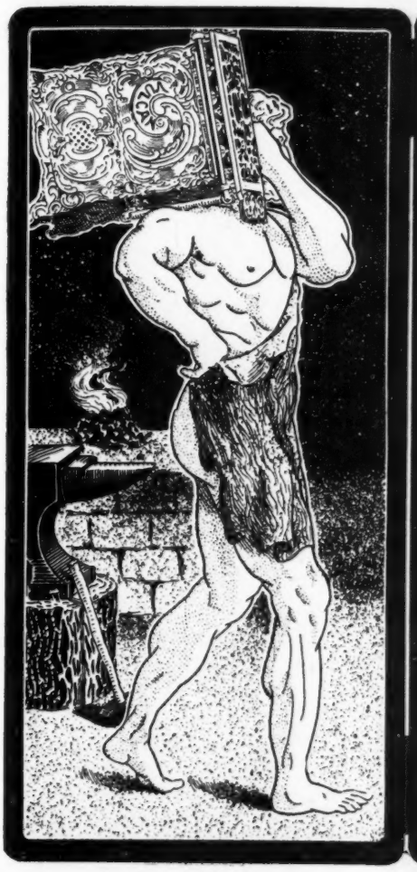

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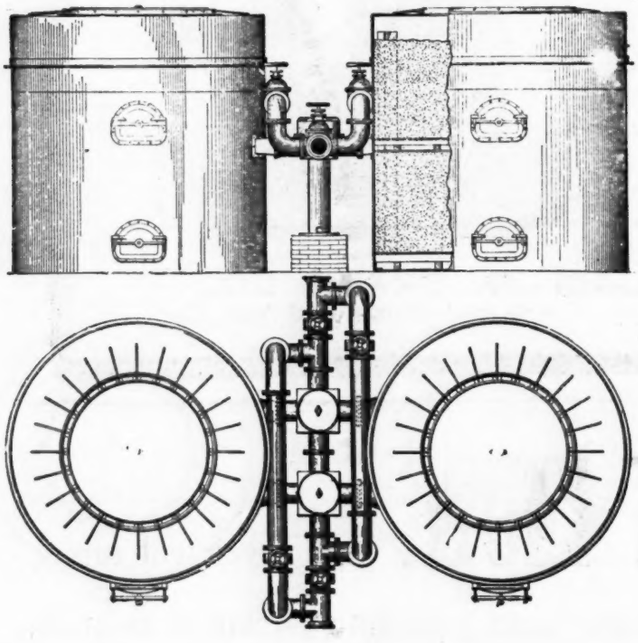

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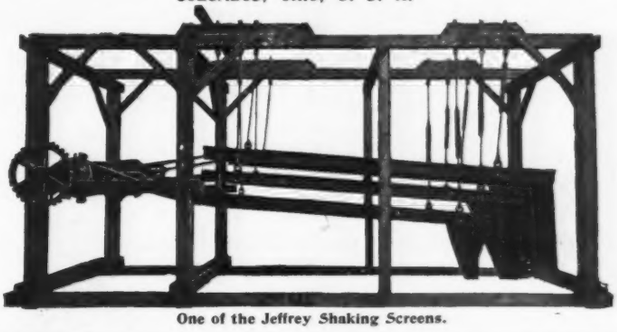

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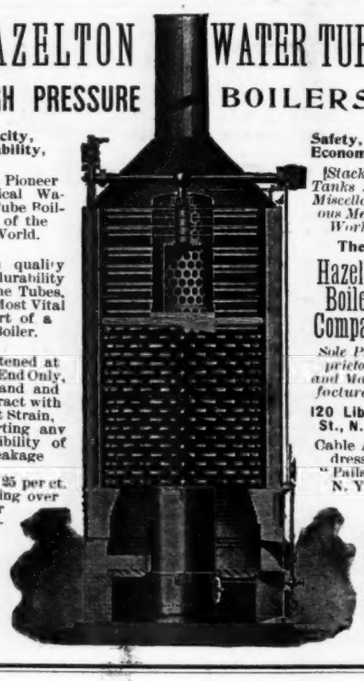

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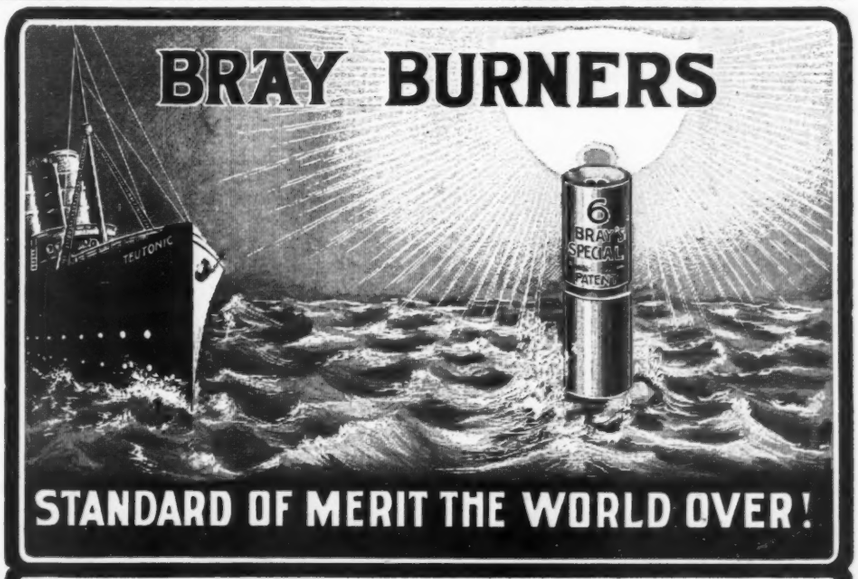

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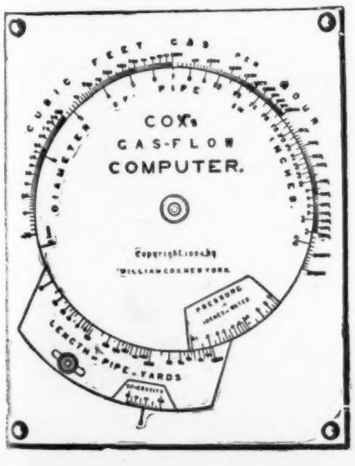

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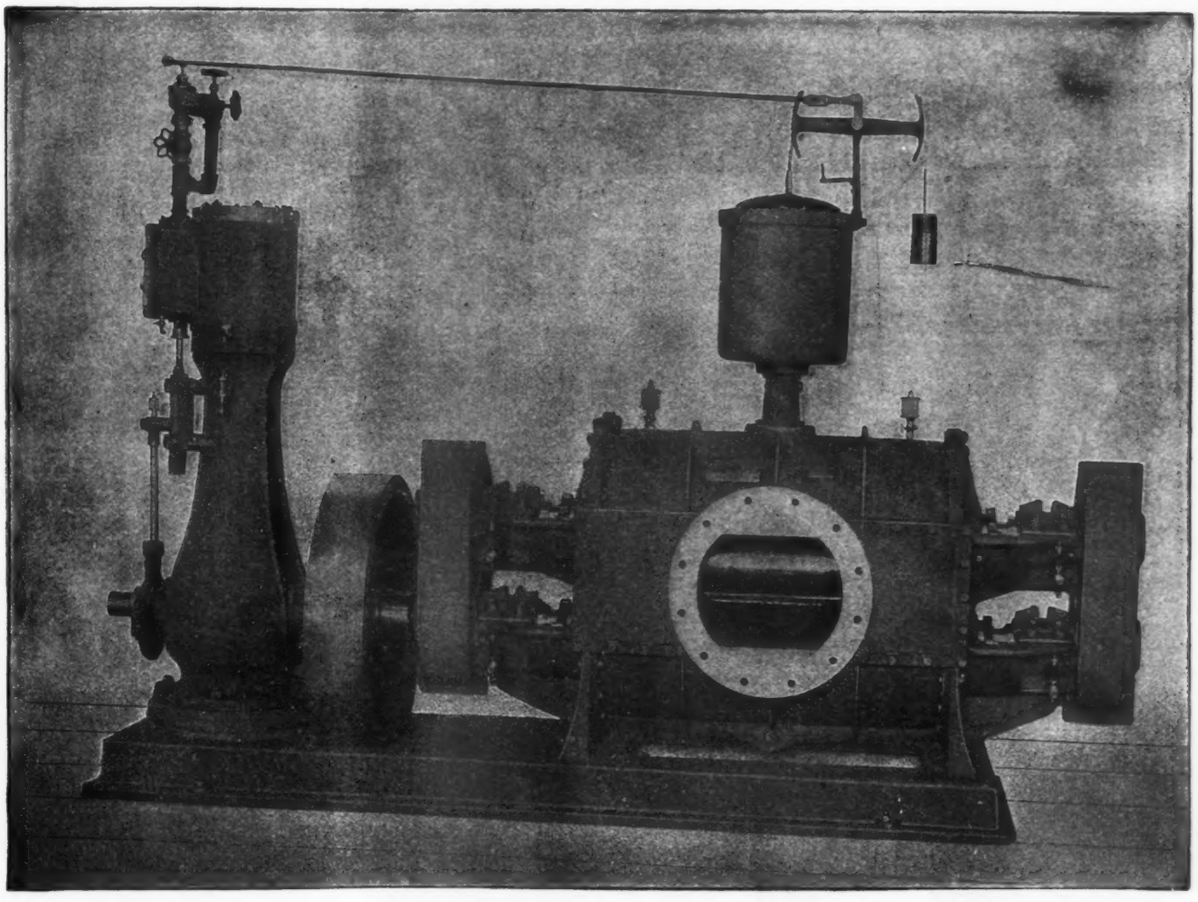

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Eastern Office:

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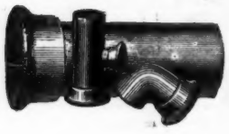
WARREN FOUNDRY AND MACHINE CO.,

Established 1856. Works at Phillipsburgh, N. J.



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FROM THREE TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF

Flange Pipe for Sugar House and Mine Work. Branches, Bends, Retorts, etc., etc.

THREE SLOTS.

THE 3-SLOT ADJUSTMENT of the ATLAS PIPE WRENCH is the simplest and most effective adjustment of any PIPE WRENCH manufactured. No exasperating delays caused by threads or nuts being burred, rusted or clogged with dirt. THE SLOT ADJUSTMENT SAVES ALL THAT TROUBLE. The "ATLAS" grips the pipe quickly and positively, and releases readily.

IT NEVER LOCKS.

Made in four sizes: 10-inch, 18-inch, 24-inch and 36-inch, handling everything from ⅛-inch wire to 4½-inch pipe. Write for descriptive folder and price list. Ask your Supply Man for the "ATLAS."

—Manufactured by—

ATLAS PIPE WRENCH CO., 121 Liberty St., New York. 51 Flood Building, San Francisco, Cal.

CHARLES MILLAR & SON CO., Selling Agents. Utica, N. Y.

Flanged Pipe and Fittings, Hydrants, Gates, Pig Lead, Jute, etc.

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Manufacturers of Lead Pipe, Solder, etc., and Jobbers of Plumbers' and Tinners' Goods.

CAST IRON PIPE and SPECIALS FOR WATER AND GAS.

Wholesale Eastern Agents AKRON VITRIFIED SEWER PIPE.

Parson's Steam Blower

FOR IMPROVING BAD DRAUGHT IN BOILERS, AND FOR BURNING BREEZE OR OTHER WASTE MATERIAL.

PARSON'S TAR BURNER.

FOR USING COAL TAR AS FUEL.

PARSON'S AIR JET TUBE CLEANER

FOR CLEANING BOILER TUBES.

These devices are all first-class. They will be sent to any responsible party *for trial*. No sale unless satisfactory. Manufactured by the WATERTOWN STEAM BLOWER COMPANY.

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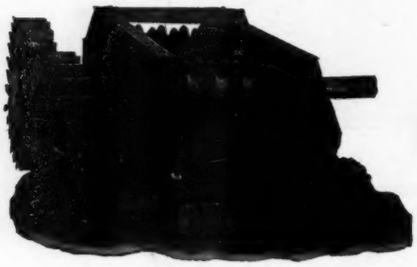

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ENGINEERS, FOUNDERS, MACHINISTS,
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Tilting Coal and Coke Cars, Breaker Rolls, Power Transmitting Machinery.

LINK-BELT ELEVATING & CONVEYING MACHINERY for HANDLING COAL, COKE, OXIDE, ETC.

Machinery designed and erected to suit existing conditions and available space.

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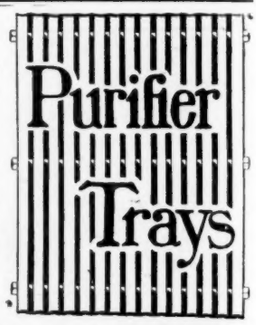

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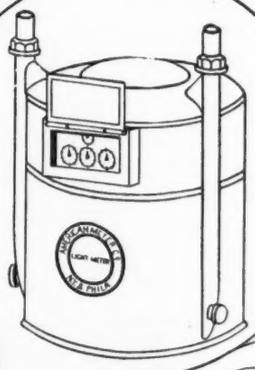
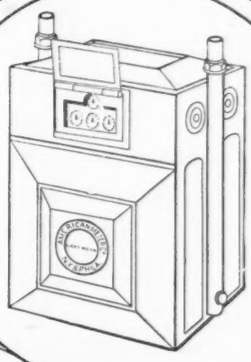
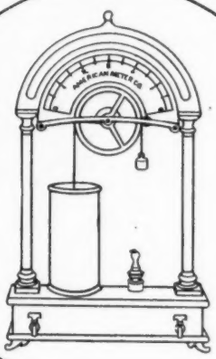


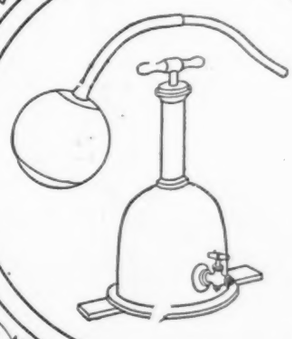


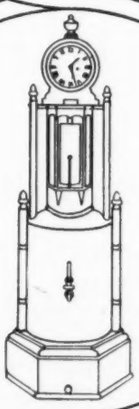


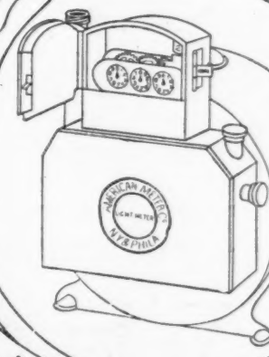
PUBLIC LIGHTING TABLE.

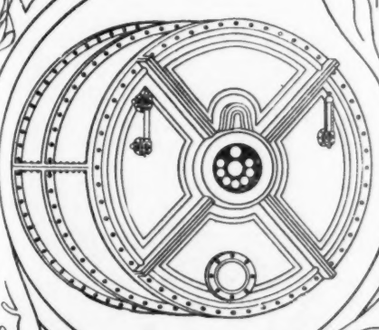
SEPTEMBER, 1901.

Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.	Table No. 2. NEW YORK CITY. ALL NIGHT LIGHTING. Light.	Extinguish.
				P.M.	A.M.
Sun.	1	7.00 PM	9.00 PM	6.30	4.20
Mon.	2	7.00	9.40	6.30	4.20
Tue.	3	7.00	10.20	6.15	4.30
Wed.	4	7.00	11.10	6.15	4.30
Thu.	5	7.00 LQ	12.10 AM	6.15	4.30
Fri.	6	7.00	1.10	6.15	4.30
Sat.	7	7.00	2.10	6.15	4.30
Sun.	8	6.50	3.20	6.15	4.30
Mon.	9	6.50	4.40	6.15	4.30
Tue.	10	6.50	4.40	6.05	4.40
Wed.	11	6.50	4.40	6.05	4.40
Thu.	12	6.50 NM	4.40	6.05	4.40
Fri.	13	6.50	4.40	6.05	4.40
Sat.	14	6.50	4.40	6.05	4.40
Sun.	15	6.40	4.40	6.05	4.40
Mon.	16	6.40	4.40	6.05	4.40
Tue.	17	7.30	4.40	5.55	4.50
Wed.	18	8.10	4.40	5.55	4.50
Thu.	19	8.50	4.40	5.55	4.50
Fri.	20	9 40 FQ	4.40	5.55	4.50
Sat.	21	10.40	4.40	5.55	4.50
Sun.	22	11.40	4.50	5.55	4.50
Mon.	23	12.40 AM	4.50	5.55	4.50
Tue.	24	1.50	4.50	5.40	5.00
Wed.	25	2.50	4.50	5.40	5.00
Thu.	26	No L.	No L.	5.40	5.00
Fri.	27	No L. FM	No L.	5.40	5.00
Sat.	28	No L.	No L.	5.40	5.00
Sun.	29	6.10 PM	7.40 PM	5.40	5.00
Mon.	30	6.10	8.20	5.40	5.00









TOTAL HOURS LIGHTING DURING 1901.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	220.10	January	423.20
February	192.30	February	355.25
March	180.00	March	355.35
April	158.30	April	298.50
May	140.40	May	264.50
June	135.40	June	234.25
July	138.00	July	243.45
August	156.20	August	280.25
September	174.40	September	321.15
October	202.30	October	374.30
November	220.40	November	401.40
December	241.30	December	433.45
Total, yr.	2161.10	Total, yr.	3987.45

NEW YORK, 33 Nassau Street. PHILADELPHIA, Broad and Arch Streets. CHICAGO, Foot of Orleans Street. BOSTON, 624 Tremont Building.
CLEVELAND, 809 Cuyahoga Building. ST. LOUIS. 712 Roe Building. SAN FRANCISCO. 712 Polk Street.

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.... OF AMERICA ....

No. 36.

Controls and Operates the

Welsbach System of Street Lighting,

Which includes its specially DESIGNED AND PATENTED BURNER for STREET and PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others Interested in Municipal and Outside Lighting.

No. 38.

Welsbach Famous Mantles.

THE INCOMPARABLE

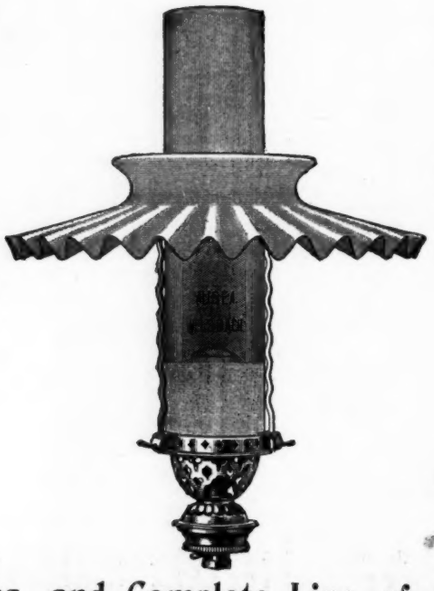
"YUSEA" Welsbach MANTLE

FINEST EXAMPLE

OF INCANDESCENT

GAS LIGHT

EVER EXHIBITED.



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Magnificent Brilliancy

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The Lowest Cost.

Welsbach Lamps, Mantles, and Complete Line of Glassware and Supplies

WELSBACH COMPANY,

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Chicago Branch Department and Supply House, - - - - - 70 Wabash Avenue.

THE STANDARD DOUBLE SUPERHEATER

LOWE WATER GAS APPARATUS.

Under Contract, 1901:

Number of Sets to August 1, 1901, - - - - - - 27

Total Daily Capacity, - - - - 28,200,000 Cubic Feet.

The United Gas Improvement Company,

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Established 1858. Incorporated 1890.

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Estimates Furnished on Application for Most Successful Style of Construction.

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Works, Weber, N. J.

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Modern Recuperative Furnaces.

Standard Fire Brick and Gas Retorts.

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Works, LOCKPORT STATION, PA.

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Successor to WILLIAM GARDNER & SON,

Fire Clay Goods for Gas Works.

HENRY MAURER & SON,

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RETORT WORKS

WORKS, Perth Amboy, N. J.

OFFICE, 418 to 422 East 23d St., N. Y.

Clay Gas Retorts,

BENCH SETTINGS,

Fire Brick, Tiles, Etc.

GEROULD'S IMPROVED RETORT CEMENT

A Cement of great value for patching retorts, putting on mouthpieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.

Price List, f.o.b. Galesburg, Ills., or Buffalo, N. Y.

In Casks, 400 to 800 pounds, at 5 cents per pound.
In Kegs, 100 to 200 " " 6 " "
In Kegs less than 100 " " 7 " "

C. L. GEROULD, Galesburg, Ills.

For orders East of Buffalo, N. Y., or Pittsburg, Pa., freight will be paid to these points.

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OAKHILL GAS RETORT & FIRE BRICK W'KS

Our immense establishment is now employed almost entirely in the manufacture of

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We have studied and perfected three important points. Our retorts are made to stand changes of temperature, the strongest heats of the furnace, and the abrasion of feeding and emptying. We construct

Half and Full Depth Benches of Our Own Design,

Containing 6, 8 or 9 Retorts.

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MANUFACTORY AT

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Clay Retorts, Blocks & Tiles

FIRE BRICK, FIRE CLAY, AND FIRE CEMENT.

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CORRESPONDENCE IS RESPECTFULLY SOLICITED.

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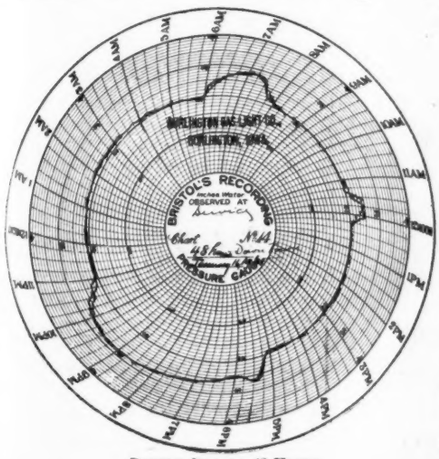
Particularly a CONNELLY Gas Governor,



DOUBLE RECORD 48 HOURS.

Is as essential to the operation of a gas works as the Governor of any of our great States is necessary to the successful working of one of these political bodies.

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Mr. Clary is only one of scores of gas managers who find Connelly Governors absolutely indispensable. We are in business to give you all the information you can wish about Governors.

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395 BROADWAY, NEW YORK.

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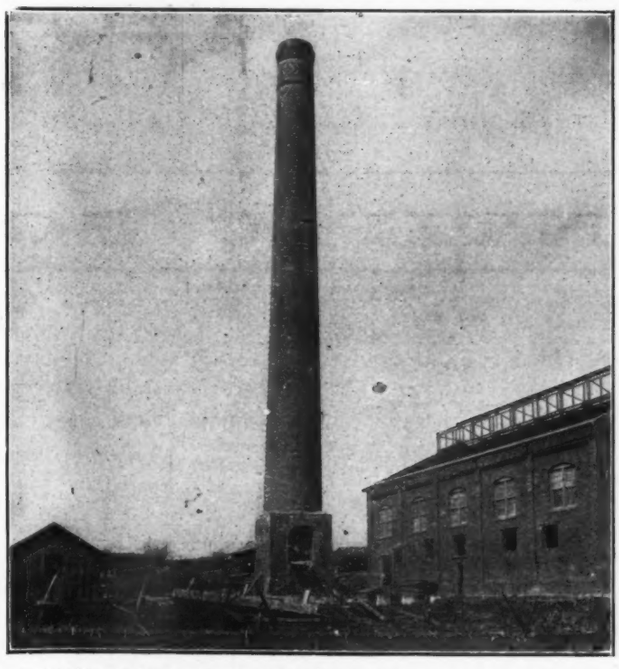
Manhattan Fire Brick & Enameled Clay Retort Works,

Designers and Builders of Chimneys of Perforated Radial Bricks.



Chimney of perforated radial bricks, designed and built by ADAM WEBER SONS for the Nazareth Cement Company, at Nazareth, Pa.

A. M. Young, President, New England Engineering Co., New York, March 30th, 1901.

Adam Weber Sons, 633 E. 15th St., N. Y. City—Gentlemen: It is a pleasure for us to state that the chimney built for us by you, at the works of the Nazareth Cement Co., at Nazareth, Pa., is an exceptionally fine one. We are certainly pleased with the workmanship on the same, and feel that there is no finer chimney anywhere if construction is considered. Yours very truly,

H. P. HAMPSON,
General Manager New England Engineering Company, at Nazareth, Pa.

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The Gas Engineer's Laboratory Handbook,

By JOHN HORNBY, F.I.C.

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By MAURICE GRAHAM, Assoc M. Inst. C.E.

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STRICTLY High Grade. . . . .
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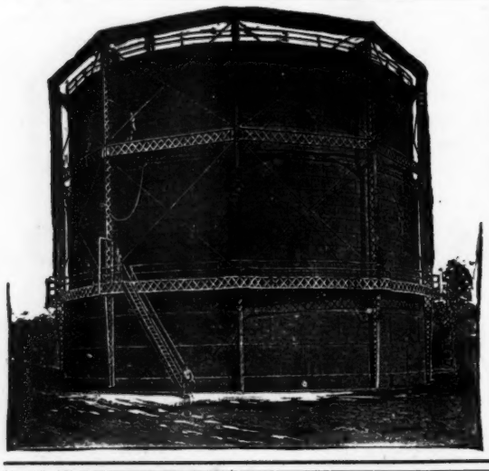

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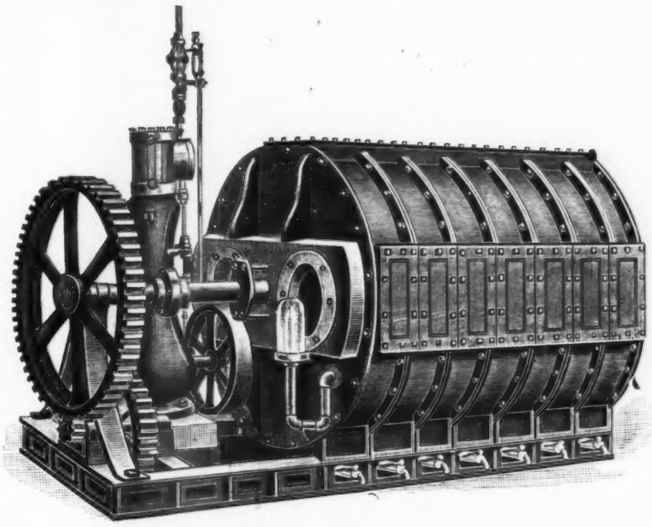

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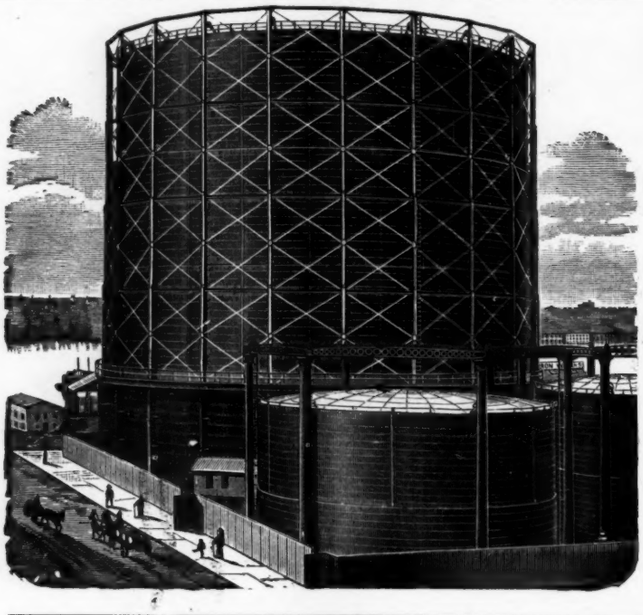

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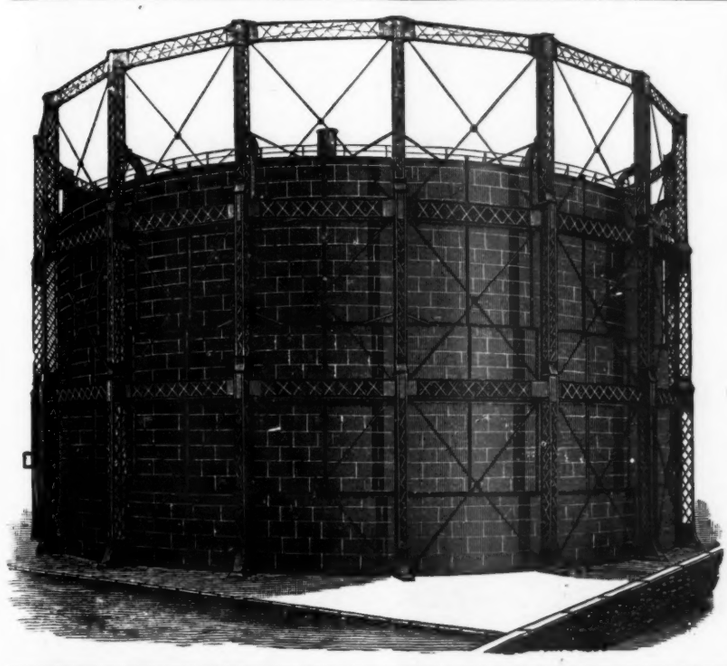

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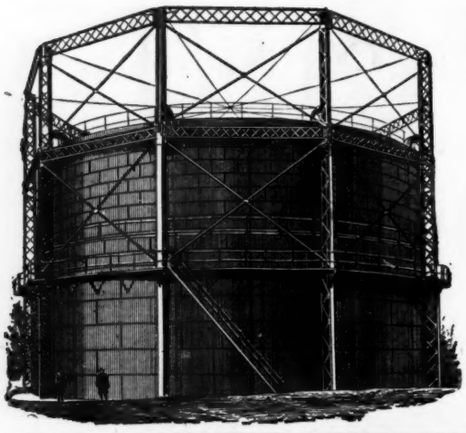

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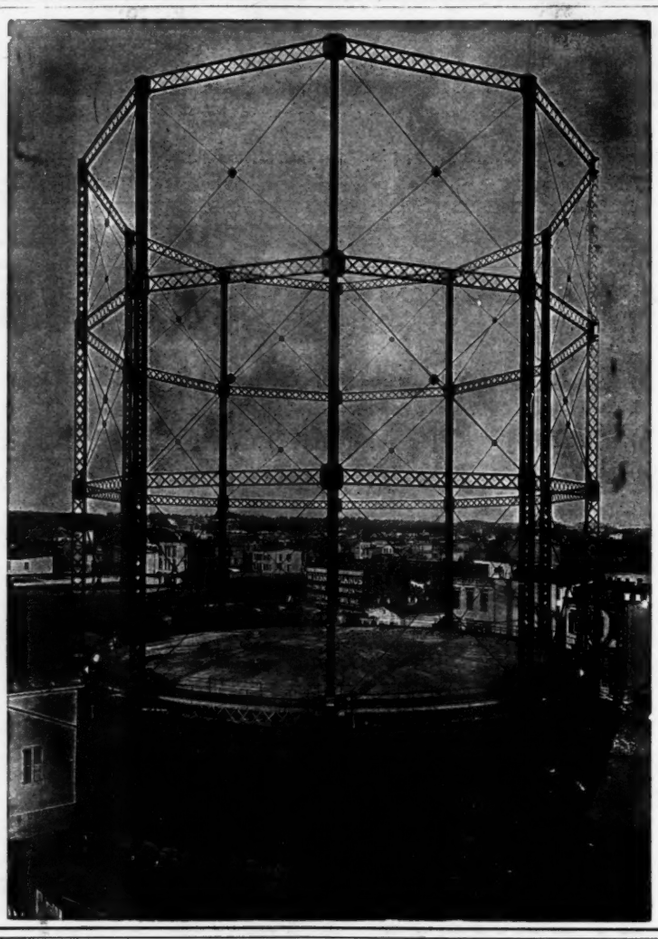

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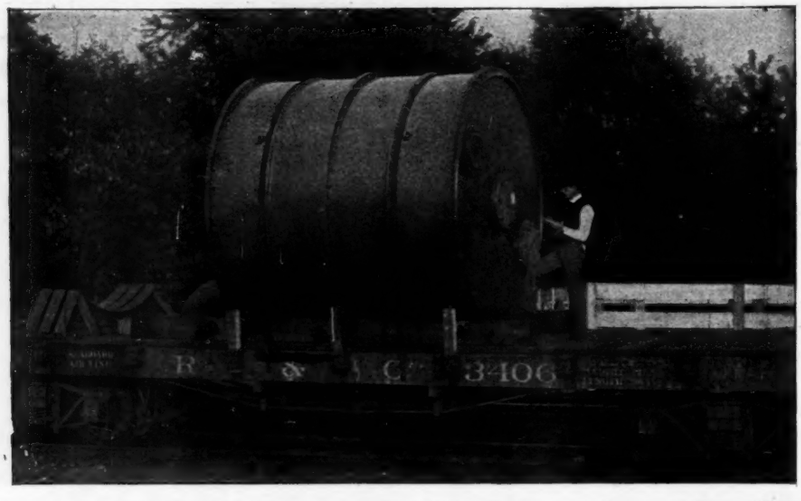

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